Draft Nez Perce–Clearwater National Forests Forest Plan Assessment

7.0 Ecosystem Services and Multiple Uses—Wildlife

March 20, 2014

Table of Contents

7.0 Multiple Uses—Wildlife

7.1 Bighorn Sheep

7.1.1 *Importance in the Planning Area*

Rocky Mountain bighorn sheep provide a popular viewing opportunity along some river corridors in the Planning area. Bighorns also provide a very limited, but highly sought after hunting opportunity in Idaho, with only a handful of permits allotted each year. Special auction tags and lottery-style sales of a single bighorn sheep hunting permit annually provide tens of thousands of dollars to Idaho Department of Fish and Game (IDFG) research and management for bighorn sheep every year. The auction tag sold for as high as $120,000 in 2009 and has averaged $82,450 per year over the last 10 years. The lottery tag raised $57,982 in 2009 and has averaged $62,031 per year over the last 10 years.

Using information extrapolated from a Wyoming willingness to pay study, O'Laughlin and Cook (2010) estimated one typical bighorn sheep unit with 5 tags to be worth $482,100 total economic value in 2008 dollars. Indirect income generated from sheep hunting activities includes monies spent by hunters on travel, food, lodging, outfitters and guides, and possibly taxidermists. Estimates for guided bighorn sheep hunts in Idaho range from $6,100 to $8,600 (USDA Forest Service 2010). Although the economic value of bighorn sheep has not been studied or quantified specifically for Idaho, we expect that benefits similar to those identified by O'Laughlin and Cook (2010) occur for direct and indirect revenues and other economic indicators.

Many people who have no interest in hunting bighorn sheep are very interested in learning more about them by observing them in the wild. The outdoor recreation industry capitalizes on this interest. For example, river rafting and jet boat touring companies frequently use the opportunity to view bighorn sheep to promote their trips. With such widespread fascination with this animal, Bighorn sheep are among Idaho's most treasured wildlife species.

7.1.2 *Status and Trends*

In Idaho, bighorn sheep exist in both small isolated populations and in interconnected metapopulations. For management purposes, the IDFG has divided these populations and metapopulations into 22 Population Management Units (PMUs). In south central and southwestern Idaho, about 1,000 California bighorn sheep occur in 6 PMUs. Bighorn sheep were completely extirpated from this part of the state; and current populations are the result of 11 translocations from outside Idaho and 18 in-state translocations between 1963 and 2004. Rocky Mountain bighorn sheep occur in 16 PMUs in central and southeastern Idaho. Eighteen translocations from out of state and 17 in-state translocations conducted between 1969 and 2005 successfully restored bighorn sheep to historically occupied habitat.

The largest native populations of Rocky Mountain bighorn sheep are in the Salmon River drainage, largely within the Plan Area.

Bighorn sheep habitat on the Forest is generally associated with the Idaho Batholith Breaklands in the Salmon and Selway River Basins. Bighorn sheep typically inhabit rugged, rocky grasslands and open forests from low elevation river canyons to alpine areas. Although elevational migrations are generally common with bighorn sheep, most bighorns in the

Planning Area remain in the river canyons year round, with the possible exception of bighorns in the Selway drainage. Although bighorn sheep are gregarious, males and females inhabit different areas throughout most of the year. Females and juveniles prefer steeper "escape terrain" while adult males often select gentler topography with more forage (Bleich et al. 2007).

Since 1995, all bighorn sheep populations have undergone surveys, most at approximately 3-year intervals. Some survey intervals vary—performed annually in select locations like Hells Canyon and in 6-year intervals in other locations. Four bighorn sheep PMUs contain a total of approximately 400 bighorn sheep on lands managed by the Forest; these include the Lower Salmon, Lower Panther-Main Salmon, Selway, and Hells Canyon PMUs.

Three hundred and seventy bighorn sheep occur along the Salmon River in areas managed by the Forest (IDFG 2010, IDFG 2013); these populations are connected to the Middle Fork Salmon PMU to the south, one of Idaho's largest bighorn sheep populations. A small population of at least 30 sheep is located on the Forest in the Upper Selway River; this population is contiguous with the West Fork Bitterroot, Montana bighorn sheep population where 120 sheep were observed in the most recent survey (2006, MDFWP 2010). Approximately 150 bighorn sheep occur west of the Forest in Hells Canyon PMU (IDFG 2010); these are connected to bighorn sheep populations across the Snake River in Oregon and Washington.

All 4 bighorn populations in the Plan Area are currently stable to declining (IDFG 2010, IDFG 2013). Although fewer than 500 bighorn sheep currently occupy the Forest and adjacent areas in Idaho, a conservative analysis suggests that the habitat could support 2,000–3,000 animals (IDFG 2010).

7.1.3 *Issues*

The primary limiting factor for Rocky Mountain bighorn sheep in the Plan Area is disease, although other factors, including predation and habitat degradation, can also be important.

Bighorn sheep are susceptible to diseases carried by healthy domestic sheep and goats and other nonnative caprids (e.g., mouflon). Domestic sheep, goats, and other exotic relatives of bighorn sheep (*caprinae*) carry diseases that are lethal to bighorns and can have lasting effects on population performance (WAFWA 2007, CAST 2008, Schommer and Woolever 2008). Bighorn sheep in the Salmon River and Hells Canyon PMUs experienced high rates of mortality in all-age pneumonia outbreaks in the 1980s and 1990s, likely originating from contact with domestic sheep. Those populations have not recovered. Bighorn populations are currently limited by low lamb survival primarily due to pneumonia-caused mortality (IDFG 2010). Disease transmission to bighorn sheep can be controlled by maintaining separation between bighorn sheep and domestic sheep, goats, and other exotic caprids. (Refer to USFS modeling "step down tool" for analysis.)

Although disease is currently thought to be the primary reason for low bighorn sheep numbers, other factors may contribute, including vegetation changes caused by increases in noxious weeds. Frequent fires have had beneficial effects by reducing conifer encroachment and rejuvenating grasses and forbs; however, fire and other disturbances may also have the negative impact of facilitating the invasion of noxious weeds. Noxious weeds could reduce habitat suitability for sheep, although further information is needed on utilization of noxious weeds by bighorn sheep.

Predation is also a factor in limiting bighorn sheep numbers. Bighorn sheep coevolved with native predators, including gray wolves, coyotes, and mountain lions; however, predation, particularly by mountain lions, can cause declines in small populations (Sawyer and Lindzey 2002, IDFG 2010).

7.2 Black Bear

7.2.1 *Importance in the Planning Area*

Black bears are found throughout the Planning Area, although suitable and occupied habitat is patchy in some areas. Black bears are important as both a target species for hunters and as a predator that may influence populations of large ungulates, like elk and deer that are also popular hunted species.

Some public demand exists to view black bears in their natural environment. As a result, the Idaho Department of Fish and Game (IDFG) has decided to provide black bear viewing opportunities in portions of some Game Management Units (GMUs) where the following occurs (IDFG Black Bear Management Plan, 1999–2010):

- Area closures on black bear hunting currently exist
- Road access is in close relative proximity to open habitats so that black bears can easily be seen
- Conflicts with other resource users in the area are minimal

7.2.2 *Biology*

In 1972, the IDFG initiated a black bear research project to collect biological data for a comprehensive management program. Six black bear populations were studied. These studies were designed to determine the status of each population, although data were also collected on food habits, physical conditions, denning requirements, activity patterns, and habitat use patterns. Research information collected from black bear populations in lightly hunted and heavily hunted areas was used by IDFG biologists to develop harvest criteria and to interpret harvest data collected through the mandatory check program.

Detailed information about black bear biology in Idaho can be found in a book authored by John Beecham and Jeff Rohlman titled, *A Shadow in the Forest—Idaho's Black Bear*. The University of Idaho Press published this book in 1994.

Black bear distribution in Idaho corresponds closely to the distribution of coniferous forests. North of the Snake River plain they are found throughout the forested mountains and foothills. Few black bears occur south of the Snake River, except in southeastern Idaho. About 75% of black bear habitat in Idaho is administered by the U.S. Forest Service; 20% is controlled by private interests; and the rest is administered by other agencies, such as the Bureau of Land Management, Idaho Department of Lands, and IDFG. Idaho has approximately 30,000 square miles of black bear habitat.

Although it is difficult to estimate the size of black bear populations, IDFG research has shown that black bear densities vary among areas in Idaho. The black bear social system limits density to 1.5 to 2 black bears per square mile in the best habitats. However, even in good quality habitats, many factors can influence the size of the black bear population in any given year. For instance, several years of poor berry crops can result in reduced cub production and increased mortality of subadult black bears. Heavy hunting pressure can also reduce the population below the carrying capacity of the habitat.

Extensive studies of black bear food habits throughout their range clearly show that vertebrates, primarily deer and elk, make up less than 2% of a bear's yearly diet. Although black bears rarely prey on adult deer or elk, they do prey on deer and elk fawns and calves in localities where favorable conditions exist for taking that prey. The fact that black bears prey on deer fawns and elk calves has never been in dispute; however, the effect of that predation on populations of deer and elk remains a major topic for debate.

Predator-prey interactions are extremely complex and involve many factors such as weather conditions, status of the prey population, availability of alternate prey, presence and density of other predators, and habitat conditions. As a result, it is difficult to determine what the effect of predation may be in any specific situation. In situations where the prey population is at or near the carrying capacity of its habitat, predation on deer or elk neonates probably has very little effect on prey population size or growth rate; and efforts to regulate predator numbers will not result in a larger prey base. However, when adverse weather, habitat degradation; or other conditions result in a prey population decline, predation may increase the rate of decline and result in a lower population level than would occur in the absence of predation. If issues of scale, logistics, and economics allow, reducing predator numbers in this situation may decrease the rate of decline and provide some benefit to the prey population.

Black bears in Idaho are long-lived; they mature late (4–7 years old), and they have low reproductive rates. Short-term changes in the size of black bear populations are related to changes in birth rates associated with the availability of nutritious foods, especially late summer and fall berry production. Long-term trends are directly related to changes in habitat quantity and quality.

Forest management practices, wildfires, and plant succession influence black bear habitat quality. The black bear's diet is primarily grasses and forbs during the spring and early summer. By mid-July, they begin adding fruits such as huckleberries, wild cherries, buffalo berries, hawthorn, and mountain ash to their diet. Approximately 10% of the black bear's annual diet is animal matter; insects comprise about 9% and vertebrates make up the remaining 1%. In many situations, partial removal of the forest overstory helps the black bear because it opens up the forest canopy and allows for increased plant production on the forest floor. However, openings and increased human access into black bear habitats makes black bears more vulnerable to hunters, offsetting the benefits of logging activity.

IDFG-sponsored research on black bear habitat patterns suggests that the following actions will maintain or enhance black bear habitat in areas where logging has been proposed (IDFG Black Bear Management Plan, 1999 – 2010):

- Minimize soil disturbance in areas where berry-producing shrubs are abundant by using rubber-tired vehicles or logging over snow cover.
- Use selection cuts to maintain black bear security cover. Retain 40–70% canopy coverage when huckleberry (*Vaccinium* sp.) is abundant in the understory.

- Maintain relatively dense pole-sized timber stands in the overall vegetative mosaic on north and east aspects for use as bedding areas.
- Retain some mature trees in logged areas to enhance their use by female black bears with cubs.
- Maintain aspen stands in the overall vegetative mosaic.
- Broadcast-burn slash or leave it untreated and minimize soil scarification to prevent damage to rhizomatous food plants.
- Create leave patches or leave strips within cutting units for security cover. Clear-cuts should be small and have irregular borders to provide security cover.
- Maintain a mix of different-aged cutting units to influence black bear density and distribution in an area.
- Logging roads should be located out of creek/river bottoms where significant blac, bear foods occur.
- Area closures to motorized vehicles should be implemented to reduce black bear
- mortality rates and increase habitat effectiveness.

Habitat loss and fragmentation due to human encroachment also has a subtle, yet permanent, impact on the long-term viability of black bear populations. Ultimately, the accelerating pace of habitat fragmentation and loss may dictate how long we can maintain black bear populations in some areas of the state.

7.2.3 *Idaho Department of Fish and Game Black Bear Population Management*

In those portions of the state where black bears thrive and populations are stable or expanding, and where black bear predation may be adversely affecting big game populations, IDFG employs harvest as a tool to maintain black bear population numbers to manage predation to help meet big game management goals. This is the case in the Plan Area: IDFG has been using long hunting seasons and liberal harvest to try to reduce black bear predation on elk, particularly in the Selway and Lolo Game Management Zones.

The vulnerability of black bear to harvest varies greatly because of differences in habitat and access. Bears are less vulnerable where cover is dense and expansive. They are particularly vulnerable in high road areas and habitats that provide only patches of security cover. This often results in populations with fewer adult black bears, especially males.

The sex and age of a black bear also affects its vulnerability to harvest. Adult males are typically most vulnerable because they are bold (often use open areas) and have larger home ranges. Consequently, the adult male segment of a population is the first to be reduced under hunter pressure. Subadult males are slightly less vulnerable. Females are least vulnerable, especially if accompanied by cubs. A low percentage of adult males (≥5 years old) in the harvest may be an indication of over-harvest.

Hunting pressure affects harvest rate, which, in turn, impacts age structure, sex ratios, and densities of black bear populations. As harvest rates increase, the proportion of subadult black bears (those less than 4 years old) in the harvest typically increases, whereas the proportion of adult males declines. At higher harvest levels, the proportion of females in the harvest increases; and harvest may result in a population decline if a large area is affected or if no reservoir areas exist nearby to produce dispersing subadult black bears. In reservoir areas, black bear populations are limited by the capacity of the habitat to support black bears and their social structure. Some species compensate for excessive adult mortality by producing more young. However, black bears do not respond in this manner. In fact, high adult mortality results in a younger age population and lower productivity (average number of young per litter). Young male black bears disperse from their mother's home range when they are 1.5 to 2.5 years old and often travel long distances to occupy vacant habitat. However, young female black bears rarely disperse far. As a result, black bear populations far from reservoir areas are slow to recover from over-harvest.

The ages of black bears captured during IDFG-sponsored research projects indicated that lightly hunted populations had a high ratio of adults to subadults (70:30), a high percentage of adult males (35%), and a median age of 7.5 years. Data collected from heavily hunted populations showed adult:subadult ratios favoring subadults (40:60), fewer adult males (21%), and a median age of 2.5–3.5 years. Studies of black bear populations in Alaska, Virginia, and Arizona showed similar relationships between lightly and heavily hunted populations. IDFG research demonstrated that age and sex data derived from trapping was closely correlated with that from the harvest. It follows, therefore, that harvest criteria have potential for monitoring population status.

7.2.4 *History, Status, and Trends*

The IDFG has relied on two primary methods to collect black bear harvest data: 1) a mandatory hunter check-in report program implemented in 1983 and 2) until 1996, an annual telephone harvest survey. The mandatory check-in report program requires the hunter to bring the skull and hide of their harvested black bear to an official checkpoint within 10 days of the kill date and to fill out a harvest report form. In most cases, a premolar tooth is extracted from the skull to determine the age. Pertinent data including kill date, location of kill, and method of take are recorded on the harvest form. Compliance with the mandatory report program is unknown.

A telephone survey of hunting license holders, discontinued in 1996 due to funding cutbacks, provided a second estimate of the black bear harvest. This survey contacted approximately three percent of the black bear tag holders and provided information from both successful and unsuccessful hunters. A statewide harvest estimate, recreation days, and hunter success rates were estimated.

7.2.4.1 Black Bear Population Status and Trends Based on Idaho Department of Fish and Game Bear Management Zones in the Plan Area

No easy or inexpensive methods exist for assessing the status of black bear populations. Therefore, IDFG biologists rely on harvest data to evaluate the status of black bear populations and the effectiveness of management actions. IDFG tracks and reports black bear harvest and populations trends by Data Analysis Unit (DAU); DAUs are comprised of one or more GMUs.

Black Bear DAU 1E

Black Bear DAU 1E includes IDFG GMUs 8, 11, 11A, and 13. Small portions of GMU 8 and 13 are located within the Plan Area; Units 11 and 11A are not in Plan Area.

DAU 1E is predominantly private land. The climate in this DAU ranges from hot and arid along the river breaks, to cooler and moister at the higher elevations. Agricultural crops and sheep and cattle allotments are plentiful and characterize this DAU. Timbered habitat is clumped and interspersed with expansive grasslands along the Salmon, Snake, and lower Clearwater River breaks. Old homesteads and dispersed fruit trees provide black bears with plentiful fall foods in some areas. Some of the largest black bears in the region are typically harvested in these GMUs.

Hunters in DAU 1E harvested a total of 80 black bears during 2011, compared to 83 black bears harvested during 2010, and a 3-year average of 80 bears harvested. Females accounted for 34% of the 2011 harvest.

Because most of the black bear habitat in DAU 1E is privately owned and in steep canyons, harvest is not evenly distributed. Hound hunting is difficult and may conflict with private landowners due to fragmented ownership. In addition, there is a lack of evenly dispersed, quality black bear habitat leading to the potential for over-harvest in portions of these isolated and/or fragmented habitats.

The current 2000–2010 Black Bear Management Plan specifies that DAU 1E is to be managed for harvest at the “heavy” level; harvest criteria did not meet objectives for the 2009–2011 seasons.

Much of the land in GMUs 8, 11, 11A, and 13 is either agricultural or river breaks, resulting in patchy, isolated black bear habitat. Consequently, most black bear harvest occurs along major road, river, and creek corridors at higher elevations. Many of the young black bears harvested are probably dispersing to new territories, with adult black bears using better quality habitats away from roads. It is likely that, without much new road access, harvest will continue to reflect young dispersing black bears. The 3-year (2009–2011) harvest was 39% female and might indicate that females were usually selecting more isolated areas, thus reducing the likelihood of mortality. The majority of black bears in any cohort being harvested in this DAU historically are 1-, 2-, and 3-year-old dispersing males.

Status and Trends—The black bear population in DAU 1E appears to be stable.

Issues—There are no current concerns about black bear populations in DAU 1E.

Black Bear DAU 1F

DAU 1F is comprised of GMUs 14, 15, 16, and 18. This DAU is about 80% USFS land within the Plan Area and 20% private and state lands. Much of the area has high road densities, has been logged, and is easily accessible. Few areas within these GMUs provide core security for black bears.

Hunters in DAU 1F harvested a total of 140 black bears during 2011, compared to 180 in 2010, and a previous 3-year average of 160. A little more than half of the black bears (51%) harvested were taken during the fall. The 2009–2011 harvest criteria indicated that the percent females in the population (34%) did not meet IDFG bear management target criteria of >40%. The percentage of males ≥5 years old (32%) exceeded the IDFG target of <25%.

Status and Trends—Prior to 1993, black bear harvest had increased in DAU 1F, probably as a result of increased road densities into previously roadless areas. In response, the previous IDFG Black Bear Management Plan (1992–2000) adopted changes in hunting seasons and hunting techniques permitted to reduce black bear harvest and improve black bear population demographics, as well as to maintain hunting opportunity with a variety of hunting techniques. Black bear populations appear to have responded to those restrictions and are stable or increasing. The 2000–2010 black bear plan calls for maintaining heavy harvest levels, though current actual harvest is at the moderate level.

Issues and Concerns—Most of DAU 1F is on National Forest lands with high road densities. Although black bear harvest criteria indicate moderate to high harvest levels in recent years, the high-quality black bear habitat in this DAU should allow black bear populations to be maintained at desired levels in reserve and roadless areas.

Blacke Bear DAU 2A

DAU 2A is comprised of IDFG GMUs 10 and 12. This DAU probably contains the most productive black bear habitat in the Planning Area. High moisture, abundant berry producing shrubs, dense forests, and roadless areas allow for relatively high-density black bear populations. However, liberal hunting seasons since the late 1970s have possibly kept black bear populations below achievable levels.

The 2000–2010 Black Bear Management Plan recognizes DAU 2A as having productive habitat able to maintain high levels of harvest. DAU 2A may serve as a reservoir of black bears for surrounding GMUs receiving higher harvest pressures (e.g., GMU 10A). Harvest occurs mainly on major road and river corridors in DAU 2A. The bag limit was increased to 2 black bears per year, both to take advantage of high black bear numbers to enhance hunter opportunity as well as to reduce the bear predation within elk productivity research study area boundaries.

In 2011, a total of 286 black bears were harvested in DAU 2A, compared to 307 in 2010, and a previous 3-year average of 281. Seventy-eight percent of these black bears were harvested during the spring. Thirty-one percent of all black bears harvested were females. Age criteria set under the current management plan allow for increased harvest since IDFG black bear plan goals identify this DAU to be harvested at the "heavy" range to reduce predation on large ungulates. Harvest values were below management criteria, falling within the "moderate" range for the 2009–2011 harvest period.

A record 12 depredation complaints were recorded during fall 1998, an indication of a poor huckleberry crop in DAU 2A. No depredation complaints were recorded in DAU 2A in 2011.

Status and Trends—The DAU is characterized by roadless habitats, public land, healthy black bear populations, and liberal hunting seasons. Harvest is moderate in the male component with 29% more than 5 years old for 2009–2011 average, exceeding the desired objective <25%. The adult female segment remains secure in the roadless segments of the DAU, with percent females harvested (31%) below the desired objective of >40%.

DAU 2A has potential for high black bear numbers because of the quality habitat. Harvest was reduced dramatically from 1993–1996 under the previous Black Bear Management Plan, but has been increased dramatically since 1998 due to liberalized hunting seasons. The black bear harvest more than doubled in 1998, and has remained at a high level since. Because black bear populations appear to be healthy, and elk populations are declining in these Units, increased harvest of black bears is desirable to address concerns about elk calf recruitment.

Issues and Concerns—None

DAU 3A

DAU 3A is comprised of IDFG GMUs 16A, 17, 19, and 20. The northern portions of this DAU receive substantial rainfall and provide some of the best black bear habitat in the DAU. Most of DAU 3A lies within wilderness and has relatively abundant black bear habitat. The habitat within wilderness is varied, with a range from poor- to high-quality habitat available throughout the year and over a variety of aspects and elevations. Because of low hunting pressure and restricted access, IDFG believes black bear populations are probably quite healthy.

This DAU probably serves as a reservoir of black bears for surrounding GMUs that are more heavily harvested. IDFG manages DAU 3A to maintain or increase historic harvest levels and distribution, although adjustments will be implemented to conform to statewide management direction. The bag limit for this DAU was doubled in 1999, both to take advantage of high black bear numbers and to increase hunter opportunity and to reduce predation affecting low elk calf recruitment.

In 2011, 121 black bears were harvested in DAU 3A compared to 130 in 2010 and the previous 3-year average of 131. It should be noted that the 192 bears harvested in 2003 and the 193 in 2004 are more than double the number killed in this DAU in any year prior to 2003; the increase in harvest is the result of an outfitter area overlap program that resulted in a substantial increase in hunter participation in this predominantly wilderness DAU. Of the 121 bears harvested in 2011, 29% were females. Forty-seven percent of the males harvested during the 2009–2011 reporting period were ≥5 years old compared to the desired objective of 25%–35% being ≥5 years old.

The black bear population data for DAU 3A suggest that a small proportion of the overall population is harvested. Age structures and harvest criteria indicate this population was the most lightly harvested DAU in the region.

Status and Trends—The black bear population in this DAU is healthy and stable. Additional management (harvest) may be desirable to manage bear predation on elk calves.

Issues and Concerns—None

7.3 ELK

Elk are one of Idaho’s most iconic wildlife species. The elk hunting tradition is part of the social and cultural fabric in Idaho going back generations. It is one of the most highly sought after big game animals in the state, generating more than $70 million annually in direct hunter expenditures like fuel, meals, and lodging (Cooper et al. 2002) and in excess of $6.15 million in license revenue annually statewide (IDFG 2007). National Forest System lands in the Plan area comprise substantial portions of Clearwater and Idaho counties; the combined economic impact of elk hunting in these two counties alone was in excess of $27.6 million in 2007.

Elk horn hunting, scouting, and viewing are also popular and traditional activities in Idaho.

7.3.1 *History and Background*

Elk occur in varying densities across every habitat type in the Planning area. Historically, elk herds were more scattered and population numbers in the Planning area were probably lower than they are today. Accounts from the Lewis and Clark expedition and trappers during the height of the fur trade generally suggested populations of elk were scattered and only locally abundant in the northern portions of the state. Populations also were further reduced during the unregulated hunting of the late 1800s and early 1900s as miners, trappers, loggers, and other settlers heavily utilized ungulates for food.

In northern Idaho, landscape changes occurred during the early 1900s, when extensive wildfires created a mosaic of shrub fields and forested habitats, leaving extensive brush-fields abundant with forage for elk. Logging also contributed to diversifying what was historically a predominately forested landscape, creating large areas of early seral habitat rich with browse. Elk flourished with the higher quantity and quality of habitat available. In north central Idaho, elk populations peaked in the 1950s. Elk herds declined, however, through the latter part of that decade and the 1960s and 1970s, partially due to maturation of brush-fields and declines in forage availability, logging and road-building activity that increased vulnerability of elk to hunters, and loss of some major winter ranges. As the newly created early- to mid-seral habitats aged and succession continued to move toward a climax condition, habitat potential declined and elk populations declined in response. To counter that drop, the Idaho Department of Fish and Game (IDFG) replaced an either-sex hunting regime with an antlered-only general hunting season in 1976. Elk herds then began rebuilding in response to revised harvest management and continued to rebuild until the late 1980s or early 1990s, when herds again began to decline in response to increasing loss of early seral habitat.

7.3.2 *Issues*

No single factor impacts elk more than habitat. As with all wildlife species, elk need adequate amounts of food, water, cover, and space throughout their lives to survive. These fundamental requirements change throughout the year as elk move across the landscape to use winter, summer, and transitional ranges. Positive or negative impacts to these seasonal habitats impact the distribution and abundance of elk. In general, decreased habitat diversity and structure results in fewer areas that can inclusively meet the needs required during the annual cycle of healthy elk herds.

Natural resource issues that alter elk habitat, such as wildfire and drought, are common throughout the western United States and impact a suite of wildlife species across the landscape. Human-caused impacts to elk habitats can also influence the ability of a habitat to sustain elk populations throughout the year. IDFG’s Elk Management Plan (cite) has identified six primary habitat issues affecting elk: invasive plants, wildland fires, timber and rangeland management, ecological succession, human development, and energy development.

7.3.2.1 Invasive Plants and Noxious Weeds

Invasive plants and noxious weeds are plants that are not native to Idaho and cause harm to people or the environment. These plants have an advantage because the insects, diseases, and animals that would normally control them are not found locally. Because these plants have no natural controls in Idaho, they are able to spread at alarming rates. Invasive and noxious weeds are moving into valued ecosystems and reducing and replacing native plants. The Bureau of Land Management estimates 4,600 acres of native habitats on federal land in the West are lost each day to weed infestation (BLM 2011).

Infestations of invasive plants and noxious weeds have major impacts on ecological conditions that support the existence of wildlife. For example, invasive plants and noxious weeds reduce and even replace native or desirable non-native plants and ultimately reduce wildlife forage, alter thermal and escape cover, change water flow and availability to wildlife, and may reduce territorial space necessary for wildlife survival. This disruptive process ultimately affects the quantity and quality of available habitat and will reduce elk populations. **(Status of invasive weeds on Forest in Section XX; management in Section YY.)**

IDFG has identified a number of management priorities to combat the effects of invasive plants on critical elk ranges (**cite EMP**):

- Prevent establishment of potential invaders
- Characterize and eradicate new invaders
- Reduce the spread of weeds by treating transportation corridors and areas of concentrated human activities, such as roads, trails, campgrounds, trailheads, parking lots, gravel pits, and satellite infestations of established invaders
- Contain locally established invaders
- Reduce the density or slow the spread of widespread established invaders
- Require the use of weed-free hay on public lands
- Inventory and map current noxious weed infestations
- Monitor sites for effectiveness of control actions
- Restore areas to prevent the re-establishment of noxious weeds and improve habitat quality of areas currently infested with weeds

7.3.2.2 Fire

Wildfire is a major ecological force that helps maintain historical plant communities. Today, few factors play as critical a role in elk habitat condition and health as wildfire. Historically, wildfires helped maintain a mosaic of plant communities across the landscape. The mosaic of successional stages of vegetation post-fire provided excellent forage and cover for elk. However, current wildfire frequencies are significantly different than historical regimes throughout many of the plant communities occupied by elk (Miller and Rose 1999). In general, current wildfire return intervals are too frequent in low elevation shrub-steppe communities and too infrequent in mid- to upper-elevation shrub and aspen/conifer communities to create or maintain optimal elk habitat.

For several years following a fire, growth of many preferred elk forage species is enhanced by an increase in nutrients (Asherin 1973, Leege 1968, DeByle et al. 1989). Prescribed burning of shrubs in grand fir and Douglas-fir forests increased forage by reducing the height of tall shrubs and promoting growth of preferred forage species (Lyon 1971, Leege 1979). *See Fire, Section XX in Plan; Fire Plan Component; Vegetation Component*

7.3.2.3 Timber and Grazing Management

Timber harvest can have both positive and negative impacts on elk. Timber harvest and the roads associated with logging cause surface disturbance to soils and ground litter, altering the amount of coarse woody debris on the forest floor. Disturbed soils along roads and in logged areas are prime spots for invasive weeds to colonize. An increase in the number of roads amplifies elk vulnerability due to the increase in human activity. Loss of security cover due to timber harvest causes elk to become more vulnerable to predators and hunters (Christiansen et al. 1993). On the other hand, timber harvest can increase the quantity of nutritional forage (Collins and Urness 1983); changes in forage relate to the inverse relationships between forest cover and understory vegetation production (McConnell and Smith 1970). Timber harvest has the best potential to benefit elk when few new roads are built or roads are closed once harvest is complete, adequate security cover is preserved, and the size of the openings are considered (Lyon and Christensen 2002).

Livestock grazing is ubiquitous in Idaho rangelands and in many parts of the Planning Area. Livestock grazing systems are designed to benefit livestock; but if designed and managed properly, they can also benefit wildlife habitat. Improper grazing management negatively affects wildlife production, plant vigor, water quality, and soil erosion and productivity. Timing of livestock grazing, especially cattle grazing, can impact elk use of habitat as elk distribution changes in response to the presence of cattle (Stewart et al. 2002), and as elk and cattle are selecting for some of the same resources during late summer (Coe et al. 2001). Some studies have suggested that livestock grazing can have a positive effect on forage conditions (crude protein, digestibility) for elk when the timing, intensity, and duration of livestock grazing are controlled. Other studies, however, do not show improvements. **See Section XX**

7.3.2.4 Ecological Succession

Elk tend to be most productive in habitats that have a mosaic of plant successional stages. Evidence suggests that this is due to associated vegetation diversity and availability of high-quality forage. The challenge is that nature is dynamic and plant communities do not remain in a single successional state. Thus, the ability of a landscape to support elk varies with these changes in habitat. **Note Veggie section XX re HRV, and PC to maintain diverse, distributed, etc. veg community.**

Elk diets vary seasonally and annually due to nutritional demands, plant phenology, and weather patterns. Elk consume both herbaceous and woody plants (Cook 2002). Elk prefer grass and forbs during the summer because of their digestibility and nutrient content, but may consume a large proportion of shrubs (Cook 2002). High elevation meadows and riparian areas are preferred summer habitats (Adams 1982). Good summer nutrition is important for the survival of cow and calf elk over winter (Cook et al. 2004). When nutrition during the summer and autumn is poor, cow elk are likely to breed later than cows with good body condition or not at all (Cook et al. 2001). Woody shrubs are eaten by elk throughout the winter. However if summer habitat conditions do not allow elk to obtain good body condition by autumn, even elk occupying high-quality winter range may not survive the winter (Cook 2011). The body condition of elk in the autumn is dependent on the quality of summer habitat and not on the body condition of the individual in the prior spring (Cook 2011).

Typically most of the edible biomass in late successional or climax forest systems is out of reach of terrestrial herbivores. In mature coniferous forests of the Rocky Mountains, more than 99% of total aboveground vegetation biomass may be tied up in trees (Wallmo 1981); shrubs and herbaceous plants make up less than 1% of the total vegetation biomass in these late-seral systems (Gary 1974, Landis and Mogren 1975). Forage supply is inversely related to the amount of tree overstory in forested habitats (Folliott and Clary 1972). However, some xeric forest habitat types maintain forage availability with overstory canopies. Mature forest can also be beneficial to elk when mature stands are associated with mid-seral stands in areas that elk frequent during late summer and early fall prior to and during the early breeding season.

In general, managing habitats in a mosaic of plant successional stages will prove most beneficial to elk. Overall plant diversity and forage is higher in recently disturbed areas. Exceptions to this might be on certain winter ranges where shrubs can take much longer to regenerate. Habitat disturbance is crucial to maintaining high-quality elk habitat. Traditionally, different fire cycles and human disturbance, such as logging, resulted in higher elk densities than occur in many areas today. In the short term, weather patterns can affect elk populations, but landscape-scale habitat changes will impact long-term trends. **Reference to Veggies Section XX, NRV**

7.3.2.5 Human Development

The primary effects of human development on elk are habitat loss and habitat fragmentation. Development includes residential, commercial, agricultural, energy, infrastructure, and other human activities. Effects can be direct, like loss or destruction of habitat, or indirect, like displacement of wildlife from otherwise suitable habitat caused by disturbance associated with human activity. Human development in elk habitat can also lead to and exacerbate depredation of crops and residential landscaping and similar human-wildlife conflicts, thereby lowering social tolerance and ultimately elk populations.

The U.S. Census Bureau reported that Idaho is the fourth fastest growing state in the union. The total population of Idaho increased 21.1% between 2000 and 2010. A Geographic Information System-based analysis of human population growth in Idaho was recently completed using census data and a projected housing density model was developed by D. Theobald of Colorado State University. This analysis included housing density projections through the year 2030. The analysis indicates that most future human settlement in Idaho will be clustered in several general areas of the state, including the Palouse area, which abuts a portion of the Planning area and contains elk summer and winter range. Elk populations that have already been adversely affected by past and current development are further threatened by predicted rapid human population expansion and associated development.

7.3.2.6 Energy Development and Mining

Increasing human populations create more demand for energy development and raw materials from mineral extractions. Energy development common to Idaho includes hydro power, wind power, oil and gas development, and transmission corridors. The impacts of energy development and mining on elk habitat are expected to increase as development continues into the future. The Plan area is currently not an active area for energy development, and mining is limited largely to small operations; however, future demands for energy or minerals may bring new pressures on elk habitat.

Exploration, construction, and production phases of energy development and mineral extraction can cause direct loss of habitat (USDI 1999). Wind turbine bases, oil and gas platforms, transmission line corridors, and the roads associated with development replace what was once wildlife habitat.

Energy development and its infrastructure can lead to disturbance that impedes key habitat functionality by altering wildlife access to or use of habitat and by causing avoidance and stress (Cox et al. 2009). Increased vehicle and human traffic, equipment noise, and noises related to mining or drilling operations can lead to elk avoiding preferred habitat. The increase in human activity along roads built for energy development and mining can lower elk survival through injury or death due to a vehicle collision, poaching, and harassment from a variety of increasing recreational activities, such as Off Highway Vehicle (OHV) use (Cox et al. 2009, Dzialak et al. 2011, Webb et al. 2011). Large-scale wind energy projects have the potential to displace elk from important seasonal habitats (USFWS 2011). Transmission corridors and associated roads can cause direct mortality and reduce available habitat due to fragmentation (Cox et al. 2009).

The issues identified in the IDFG Elk Management Plan are similar to those described by Christensen et al. (1993), who said habitat effectiveness should be used in forest plan revisions as an indicator of ability and distribution of quality habitats to support elk. Habitat effectiveness addresses the ability of habitat to meet elk needs for growth and welfare (Lyon and Christensen 1992). The most notable forest management practices that influence habitat effectiveness are motorized access, availability and distribution of suitable and adequate forage, the extent and connectivity of cover, and spatial relationships with intermingled ownerships (Christensen et al. 1993).

7.3.2.7 Issues, Stressors, Concerns

Winter forage Availability within Plan Area is Below Natural Range of Variability

Winter is typically the most crucial season affecting elk survival. Elk winter in areas that provide access to shrub and grass forage capable of sustaining individual survival and herd reproductive fitness through the winter (Citation from EMP). Nearby thermal cover, provided by overhead canopy, is also important, especially in severe winters. Winter ranges in the Planning Area are typically associated with breakland landscapes. The recommended standard for effective elk habitat is a ratio of 40% hiding and thermal cover to 60% forage (Elk NA cite)—with a forest canopy of XX%. The winter range maps used for this analysis were produced for the 2007 draft Forest Plan utilizing a Rocky Mountain Elk Foundation winter habitat model that used aspect and elevation to identify winter habitat. This winter range maps was further refined by Forest Service and IDFG biologists based on firsthand knowledge and experience of elk winter habitat use in the Planning area.

Elk Habitat (browse) is Below Desired Conditions

The availability, distribution, and quality of suitable browse is below desired conditions and trending downward on a substantial portion of the lands on the Nez Perce–Clearwater National Forests. Factors contributing to these conditions include a combination of advancing forest succession on winter, calving, and breeding ranges; and a lack of fire to regenerate quality winter browse. In bunchgrass winter ranges of the Salmon River basin, preferred winter bunchgrass forage species are threatened by invasive plants and noxious weeds.

Managing forest conditions and treating invasive weeds would promote well-distributed patches of desired browse and grass habitats required to meet high-energy demands.

Summer range includes the habitat used by elk from about late green-up (May) until they move to winter ranges, but prior to the hunting season (Christensen et al. 1993). Recent research indicates that quality of summer and fall ranges largely determines the condition of an elk heading into winter and whether that elk can survive winter (Cook et al. 2004). A relatively small difference in forage quality consumed by elk in summer and autumn can have strong effects on fat accretion, timing of conception, probability of pregnancy of lactating cows, calf growth, yearling growth, and yearling pregnancy rates. Forest management focus is on maintaining the ability of the habitat to meet elk needs for forage, water, security, or space, as well as protecting special features like licks and wallows.

In Forest Plan revisions, habitat effectiveness should be used as an indicator of ability and distribution of quality habitats to support elk (Christensen et al. 1993). Habitat effectiveness addresses the ability of habitat to meet elk needs for growth and welfare (Lyon and Christensen 1992). The most notable forest management practices that influence habitat effectiveness are motorized access, availability and distribution of quality forage, the extent and connectivity of cover, and spatial relationships with intermingled ownerships

Human Disturbance and Displacement (loss of habitat or habitat availability)

Geist (1978) defined harassment on wildlife as actions that may only cause arousal in one situation, but may lead to panic, exertion, or death in another situation. He suggested that harassment was most damaging when animals were in poor condition and when disturbance was frequent and unpredictable.

Disturbance may have both immediate and long-term effects on wildlife. The reactions of animals to disturbance can cost calories of energy and grams of nutrients (Moen 1973), which also may have a physiologic effect on individuals. The immediate response of many animals to disturbance is a change in behavior, such as cessation of foraging, fleeing, or altering reproductive behavior (Knight and Cole 1991). Over time, energetic losses from flight, decreased foraging time, or increased stress levels come at the cost of energy resources needed for an individual’s survival, growth, and reproduction (Geist 1978). At the population level, physiological response may result in reduced productivity (Yarmoloy et al.1988). A single disturbance event per day can elicit a flight response in elk (Wisdom et al. 2004).

Summer nutrition is critical for the capability of cow elk to produce healthy calves (Canfield et al. 1999). Although winter conditions stress elk and other ungulates, the availability, distribution, and access to quality summer habitats is critical to building body fat sufficient to survive the winter and produce healthy calves. Human disturbance has the potential to displace elk from preferred habitats during these critical periods and compromise their ability to survive and reproduce, potentially affecting populations (Canfield et al. 1999). Behavioral responses of elk to human disturbance include greater use of cover (Irwin and Peek 1983), increased movements (Cole et al. 1997), and avoidance of roads (Rowland et al. 2000). Human disturbance is likely to be most detrimental if it is frequent and unpredictable (Knight and Gutzwiller 1995).

When elk are displaced into poor-quality habitats, they may expend more energy on thermoregulation or be forced to use poorer quality forage (Cassirer et al. 1992).

Displacement of elk into poorer habitat might be equally or more detrimental than increased energetic costs caused by movement (Hobbs 1989). The increased energy expense of moving away from disturbance, coupled with a loss of forage intake, could have population-level impacts, especially if the areas they occupy to escape disturbance offer reduced forage quality. Cook et al. (2004) suggested if elk body fat was reduced below 9% as the animal enters winter, the probability of that animal not surviving winter increases. Limiting motorized access into elk habitat is a management tool that could increase survival and reproduction of some elk populations. When roads/trails are closed, elk reduce daily movement and have smaller home ranges. By reducing energy expenditures, elk can increase fat reserves, survival rates, and productivity (Cole et al. 1997).

Roads and Trails

Access into elk habitat has long been an issue facing wildlife managers. Historically, access was created as roads were built into forested habitats for timber production. Those new roads allowed more hunters to access elk habitat. Concurrent declines observed in bull:cow ratios in many elk herds led to concerns and research regarding the effects of access and roads on elk vulnerability and habitat security. Wildlife managers have identified elk habitat security and vulnerability as important issues.

Motorized access into elk habitat, which was previously an issue with hunters during the fall season, now occurs year-round and presents a host of new issues. Modern OHVs allow recreationists access to elk habitats that were once secure. And use of motorized roads and trails is no longer limited primarily to hunting seasons, but now occurs year-round.

Many trails originally used for stock and hiking are now accessible to motorized users. Additionally, motorized users can access more terrain per day, thereby potentially impacting more than other forms of recreational travel (Wisdom 2004?). Growing demands for back-country recreation can increase the cumulative effects on elk biology and their seasonal habitats. Understanding how motorized recreational activities potentially influence elk and habitat use is necessary to evaluate management options and make informed management decisions.

Habitat adjacent to roads and trails that are open to motorized travel is avoided by elk; and motorized disturbance increases daily movements by elk. Declines in elk populations could occur if elk avoidance of roads and motorized trails result in decreased diet quality for the animals, displacement from necessary security or thermal cover, or other impacts. Although social and biological trade-offs associated with open roads and motorized trails vary, the increase in number of traffic and people due to increased access is almost always detrimental to elk. Access management and mitigation for the negative impacts of roads and trails on elk will be a challenge for managers to address in the future. Generally speaking, it is not the physical footprint of roads and trails that affect elk, rather it is the motorized traffic and human disturbance associated with roads and trails that elk avoid (Wisdom et al. 2005).

Although the impacts are often similar, the effects of motorized disturbance on elk can be divided into two general categories: vulnerability to harvest and hunting pressure, and disturbance or displacement from preferred habitat. Both categories effect elk biology and behavior.

Vulnerability

Elk move away from human disturbance whenever harassed; however, elk that remain in roaded areas encounter more hunters over a longer period of time than elk occupying secluded habitats (citation). Roads built into elk habitat for timber management and other activities increase hunter access and, subsequently, increase elk vulnerability to harvest (Leptich and Zager 1991, Unsworth and Kuck 1991). Increased motorized access and vulnerability affects elk population structure. Leptich and Zager (1991) documented higher bull mortality rates (62% mortality) in highly roaded areas in Idaho compared to areas with few roads (31% mortality). In the highly roaded area, no bull lived past 5 years, whereas the area with few roads had bulls living in excess of 10 years. In highly roaded areas, fewer than 10 bulls existed per 100 cows; however, closing roads boosted sex ratios to nearly 20 bulls per 100 cows. Unroaded areas had almost 35 bulls per 100 cows.

Access management is a tool that wildlife managers can employ to maintain healthy elk populations and maintain public hunting opportunities without restricting seasons (e.g., controlled hunts, weapon restrictions, shorter seasons, or seasons during a less desirable time of year). Reduced disturbance by motorized vehicles, reduced hunter densities in non-motorized areas, and potentially greater success rates can provide a higher quality hunting experience for many hunters (McLaughlin et al. 1989). Without access management, elk populations generally develop undesirable sex and age structures. These, in turn, require increasingly complex and restrictive hunting regulations and, ultimately, loss of opportunities for hunters, watchers, and other non-consumptive users of the elk resource (Leptich and Zager 1991).

A direct correlation exists between road access and the number and age of bulls in a population: Bender and Miller (1999) demonstrated that limited entry hunts allow significantly greater bull survivorship into prime age classes than general season hunts. When older bulls are present in a population, cow elk conception dates are earlier and more synchronous, resulting in calves being born earlier and over a shorter time period each spring. This, in turn, may provide a number of survival benefits (Noyes et al. 1996). A synchronous birth pulse results in fewer calves taken by predators in the spring. Calves born later in the year will subsequently be smaller entering winter and more susceptible to predation and starvation. The breeding age of bulls affects elk productivity in a similar fashion.

Disturbance by Hunting

In addition to harvest mortality, increased vulnerability to hunting pressure has indirect impacts on elk populations. Hurley and Sargeant (1991) noted that elk near open roads increased their use of dense cover during hunting seasons, and Batcheler (1968) documented that red deer (an elk) similarly restricted themselves to the cover of substandard habitat in response to hunting pressure. Batcheler (1968) likewise noted declines in productivity of red deer related to hunting pressure. Squibb et al. (1986) documented that heavy hunting pressure delayed conception dates of elk.

Motorized Disturbance and Displacement

Motorized off-road vehicle travel on public lands is among the fastest growing forms of outdoor recreation in the United States (Cordell et al. 2005, Idaho OHV Outreach Project

2007). Of the 8 National Forests in Idaho, English et al. (2004) reported the Clearwater National Forest ranked first in estimated ATV participation, accounting for approximately 20% of total recreation visits to the Forest. In addition to increased numbers, ATVs have capabilities that allow access to remote landscapes.

The effects of motorized access on elk have been extensively studied. A preponderance of field studies indicates motorized travel elicits both behavioral and physiological responses in elk.. As human populations and technology increase, recreational use of roads and trails dissecting summer and winter habitat is occurring with increasing frequency, intensity, and duration. The preponderance of evidence in the literature indicates that this increased access will have significant adverse impacts on elk unless managed carefully.

The cumulative effects of predation and reduced access to quality foraging habitats are believed by biologists to be the most significant contributing factors retarding recovery of struggling elk population over much of the National Forest managed landscape. Human disturbance associated with roads and trails cause elk to vacate otherwise suitable habitat to avoid human activity; the period of time before elk return to vacated habitat depends on the severity and duration of the disturbance, but could be months or years (Lyon 1983). Elk habitat is reduced not only by the amount of land taken by the road or trail proper, but also because elk avoid the areas adjacent to such roads (Lyon 1979, Lyon 1983). Ward et al. (1980) demonstrated that even productive habitats may be abandoned by elk if human disturbance is excessive.

In areas with high road densities, elk exhibit higher levels of stress and increased movement rates (Rowland et al. 2005). Increased movement increases the vulnerability of elk to predation or harvest (Hurley and Sargeant 1991). The energetic cost of moving away from disturbance associated with roads and trails may be substantial (Cole et al. 1997) and could limit population productivity or reduce an elk's ability to withstand winter by depleting fat reserves (Cook et al. 2004). The displacement of elk away from roads and trails may cause substantial reductions in habitat utilization. Population level impacts could occur if elk are forced into marginal habitats to avoid disturbance. Morgantini and Hudson (1985) observed changes in elk diets from grazing to browsing when disturbed during the hunting season. **(Other references)** Such a shift could have a negative impact on elk survival and reproductive performance during severe winters.

Numerous studies (Frair et al. 2008, Sawyer et al. 2007, Rowland et al. 2005, Christensen et al. 1993, Lyon 1983, Lyon and Jensen 1980, Thomas 1979) have demonstrated that elk avoid areas near open roads. Christensen et al. (1993) recognized that influences of motorized vehicle travel can reduce the amount of available habitats on elk summer range. The degree of impact to elk from habitat displacement varies with location, hunting pressure, and relative importance of habitats into which motorized access and human disturbance intrudes. Studies indicate that elk respond less to constant non-stopping vehicle traffic than to slow vehicle traffic that stops periodically (Ward 1976, Leege 1984). The greatest negative responses to recreational activities (either motorized or non-motorized) for several ungulate species were attributed to unpredictable or erratic occurrences (Canfield et al. 1999).

Elk strongly selected habitat increasingly distant from roads open to motorized traffic at the Starkey Experimental Forest and Range in northeast Oregon (Rowland et al. 2000, 2004). Lieb (1981) found elk preferred areas with low noise levels, and Edge (1982), Hershey and

Leege (1982), and Marcum (1975) reported that elk avoided roads with the greatest traffic rather than roads themselves. Avoidance of open roads was greatest when cover was absent, during hunting season, and on high-standard primary roads (Lyon et al. 1985). Limited vehicle traffic behind closed gates has been demonstrated to reinforce avoidance behavior (Lyon 1979b).

Rowland et al. (2005) concluded that reduction in effective habitat for elk is the ultimate effect of elk displacement; however, substantial reductions in elk habitat use are typically confined to less than 1/2 miles from an open road. Declines in elk habitat use have been reported within 0.25–1.8 miles of open roads (Lyon and Christensen 2002). Elk appear to need more space where] more roads exist (citation and further explanation?).

Elk generally show the strongest avoidance response to motorized travel compared to other types of recreation. Elk are more likely to take flight, at a greater rate of movement and duration and at a greater distance, from motorized than non-motorized off-road recreation (cite. ?). Elk disturbed by human activity typically move to denser cover or beyond a topographic barrier (citation). When exposed to repeated disturbance from traffic, elk are known to travel farther and continue to avoid areas near motorized trails or roads (citation).

Recent elk research addressing motorized recreation has made a direct connection between ATVs and impacts to elk (Vieira 2000, Wisdom et al. 2004, Wisdom 2007, Preisler et al. 2006, Grigg 2007). Canfield et al. (1999:6.16–6.17) and Toweill and Thomas (2002:808) determined the effects of motorized trail use are similar to the effects of open roads. Wisdom (2007) reported that repeated exposure to ATVs over 3 years increased elk avoidance of ATV trails during periods of both ATV use and non-use. Rowland et al. (2004), found that elk select habitat or cover away from roads. In southwestern Montana, elk responded to motorized access by requiring summer home ranges two to three times larger than expected (Grigg 2007) and Peek et al. (1982) suggested that high levels of human disturbance may result in the abandonment of home ranges by elk. Displacement from habitat near roads open to motorized travel reported by Lyon et al. (1985) and Rowland et al. (2000) is likely to be continuous as long as the roads are open to motorized traffic.

Topography may affect impacts of motorized activities on elk behavior. Montgomery et al. (2013) demonstrated notable differences in the way elk responded to roads: by road type, between sexes, and across seasons. The influences associated with road traffic were more noticeable within the core of elk home ranges. Their analysis demonstrated that visibility from roads should be considered in addressing elk management strategies. Frederick (1991) and Edge and Marcum (1991) also concluded that topography can influence elk habitat use near roads. Edge and Marcum (1991) reported that radio-collared cow elk in western Montana showed displacement from sources of human disturbance to be more pronounced when activities occurred on ridge tops or in simple bowl-shaped basins without internal ridges. They also reported that topographic barriers to disturbance sources (road traffic) consistently had higher probabilities of elk use during the calving and summer seasons.

The factors that cause elk to respond to motorized traffic are often ambiguous or poorly understood. Wisdom et al. (2005a) and Preisler et al. (2006) found in some circumstances that, at least one-third of the time, elk failed to take flight when close to off-road activity. They reasoned that local topography and/or cover, or possibly other factors, may provide the security necessary for elk to remain static. Documented examples exist where elk have found refuge from hunting pressure in National Parks and urban areas (Thompson and Henderson 1998) and have become habituated to human disturbances associated with roads (Frair et al. 2008, Cassirer et al. 1992, Schultz and Bailey 1978, McKenzie 2001).

Wisdom (2005) suggested that potential effects to elk disturbance, when compared to other forms of recreational travel, were greater with motorized recreation. The conclusion was based on the capability of ATV to travel greater distances on any given outing. Wisdom (2005) recommended restricting motorized travel where routes dissect seasonally critical habitats; . providing elk habitat security by protecting whole areas rather than using individual route closures; designing routes to secure large patches of undisturbed habitat; and seasonal closures of seasonally critical habitats.

Disturbance Effects during Critical Times

Disturbance and displacement of elk from critical habitat or during times when elk are especially vulnerable will exacerbate impacts. Elk cannot compensate for disturbance on important seasonal ranges (Kuck 1986). Road and trail restrictions during critical times of the year can be beneficial management tools.

Winter Range

Because forage quality and quantity is reduced during winter, increased energy expenditures by elk may impact mortality. Also, because elk are concentrated into more restricted space, the opportunity for disturbance is increased and the effects of disturbance magnified. Limiting human disturbance can eliminate unnecessary energy expenditures of elk during winter (Parker et al. 1984). In Austria, red deer reacted to hunting disturbance by changing locations, and after persistent disturbance, abandoned traditional wintering areas for the year (Schmidt 1992).

Calving/rearing Habitat

Elk calving usually occurs from early May into mid-June throughout the Northwest (Raedeke et al. 2002); June 1 appears to be a relatively common average calving time in the Planning Area (IDFG). However, it is important to note that 40%–60% of all calves may be dropped toward the end of that period, thereby moving peak calving toward the latter half of the calving season or mid-June (Raedeke et al. 2002).

Weaning of elk calves after birth generally requires 8–12 weeks. Until calves are weaned, they are unable to survive on their own and a calf will die if permanently separated from the cow before it is fully weaned. Temporary separation of cow and calf during weaning can lead to reduced condition and lowered survival of calves. Juveniles 8 weeks postpartum may be developed into fully functional ruminants; but development of rumination patterns similar to adults requires another 4 weeks or so (Cook 2002). Condition of calves contributes to their survival; and disturbance during these early life stages may not only result in reduced condition, but also increased predation on calves (cite White and others in predation EMP).

Elk calving occurs widely across the landscape. Typically, however, elk select habitats that provide hiding cover for the calf, nutritious forage, proximity to water, and are transitional from winter to summer range. Elk do not show fidelity to specific calving sites; however, elk return to areas offering preferred conditions year after year, thus establishing preferred or traditional calving areas. Calving typically depends on the availability of succulent and nutritious vegetation related to the receding snowline and plant phenology (Skovlin et al.) Distance of forage from the forest edge and ecotones are also important to provide early cover for calves and a transition from forest to forage (Johnson 1951; Reichelt 1973). Elk typically give birth in the timber and move to open grazing areas several days post-birth. Phillips (1974) reported that calving elk in the Sawtooth National Forest selected timber with a 20–60% (average 37%) overstory for calving. Slope is probably not critical for calving areas, but elk do select gentler slopes for calving/rearing (Skovlin et al. date?); slopes of 20–40% are typical. Leege () reported calving in the Plan Area on 15% slopes.

Preferred or traditional elk calving areas were mapped based on conditions described in the literature for the Nez Perce–Clearwater National Forests using slopes less than 40%; generally with a south-southeast aspect; and elevation below 5,000 feet. Forest, IDFG, and other biologists with knowledge of the Plan area and elk calving behavior in the area identified or modified mapped areas based on their local knowledge and experience.

To ensure the healthy development of an elk fetus, cow elk must minimize energy costs that exceed those required for maintenance (Geist 1978). Any human disturbance that causes cow elk to move from or abandon favorable habitats has the potential to affect the health of a population (Lees 1985). Geist (1971) suggested that prolonged, frequent, and unpredictable human disturbance could severely alter behavior, reduce calf survival, or contribute to cows aborting their fetus. Kuck et al. (1985) documented that disturbed elk will abandon traditional calving areas and move into smaller, less favorable habitats; a shift into poorer quality habitats could result in reduced calf survival or aborted fetuses.

Disturbed elk and calves increase daily movements, exposing them to predators, reducing fat reserves, and reducing survival in winter (Peek et al. 2002, Raedeke et al. 2003). Phillips and Alldredge (2000) documented declining calf:cow ratios when cow elk were displaced by humans during calving season. Water and riparian areas are important to lactating elk (McCorquodale et al. 1989), but in Idaho many roads and trails follow the linear nature of the drainages in the bottom of canyons, thus subjecting elk to unnecessary disturbance/harassment during this critical time of year. Shively et al. (2005) observed reduced productivity of elk during calving season when disturbed by humans and recommended seasonal closures, or at least restrictions, on recreational activities during calving seasons.

Elk select habitat for calving and rearing that will provide suitable cover and forage for both mother and calf. Elk calving areas with highly digestible forages may be limiting (Leege 1984). Seasonal forage quality and quantity are essential to animal fitness and herd productivity (Nelson and Leege 1982, Irwin and Peek 1983, Hobbs and Swift 1985, Marcum and Scott 1985, Merill and Boyce 1991, Cook et al. 1996).

Geist (1982) suggested that female ungulates differentially selected habitats that maximized offspring survival. Open habitat components in June can be expected to have a higher quantity and quality of forage (Irwin 1976, Lyon and Jensen 1980). Schlegel (1986) reported that radio-collared calves moved to forested habitats on cooler, north aspects in July. Calves were not observed on summer range in Idaho’s Selway country until July 4 (Young and Robinette 1939). Cow-calf groups used more heavily forested habitats at intermediate to higher elevations during July in western Montana (Marcum 1975).

Further, increased movements and displacement to more marginal habitats could theoretically increase exposure to predation. Kuck et al. (1985) reported that vulnerability to predation may be increased through any combination of nutritional stress or abandonment. Most predation on elk calves occurs within one month after birth (White et al. 2010). Predation accounted for 47% of elk calf mortality on Coolwater Ridge in the Lochsa drainage of north central Idaho (Schlegel 1986). Zager et al. (2007) reported that predators killed 55% of all marked elk calves during the summer on the Lochsa, and 39% of elk calves during the same period on the South Fork of the Clearwater River in Idaho.

Elk calf survival greatly influences population trends. Elk herds in north central Idaho generally have the lowest calf:cow ratios statewide (Compton 2009). White et al. (2010) indicated that declines in elk populations in north central Idaho are likely influenced by the complex and confounding interactions of habitat limitations (primarily forage availability and quality) and predation. In some, but not all, elk management units, calf recruitment and survival rates of adult cow elk are currently below the threshold necessary for population stability or growth.

In the case of limited key habitats, such as elk calving areas, it may be that the only option available to protect elk recruitment is to seasonally restrict motorized traffic. Approximately XX,000 acres of elk calving areas are mapped in the Plan area. Approximately XXX miles of road and motorized trails abut or transect mapped calving habitat on the Forests.

Motorized disturbance presents a potential stressor to the productive capability of struggling central Idaho elk herds. Reproductive success of elk could be compromised where human disturbance displaces elk from calving areas and restricted winter habitats (Geist 1982, Skovlin 1982, Hutchins 2006). Leege (1984) and Servheen et al. (1997) recommend restricting human activities on established elk calving and rearing areas in northern Idaho. Phillips (1998) recommended that recreational traffic be routed away from areas in which elk are known to calve. To ensure that adequate areas of calving habitat remain undisturbed, Phillips and Alldredge (2000) suggested maintaining low trail densities in traditional calving areas and selective use of calving-season closures. Shively et al. (2005) recommended selective closures, or at least restrictions on recreational activity during calving season.

In 2010, IDFG reviewed available literature and recommended to Clearwater National Forest what IDFG termed “marginally protective” seasonal restriction to motorized access from May 1 to August 1 adjacent to or through key elk calving grounds. IDFG’s recommendation used a least-conservative estimate of 8 weeks postpartum for calves to become fully functional ruminants and a June 1 median for the calving (IDFG letter to Brazell, date; IDFG comments re DRAMVU). An independent wildlife review by Hershey (2011), commissioned by the Clearwater National Forest for travel management planning, recommended permanent closure of elk calving areas to motorized use based on the same sources.

Summer–Fall

Biologists have long understood the importance of limiting disturbance on winter range or during calving season. However, recent research indicates that quality of summer and fall ranges largely determines the condition of an elk heading into winter and whether that elk can survive winter (Cook et al. 2004). A relatively small difference in forage quality consumed by elk in summer and autumn can have strong effects on fat accretion, timing of conception, probability of pregnancy of lactating cows, calf growth, yearling growth, and yearling pregnancy rates. Effects of summer-autumn nutrition on fat accretion of cows and growth of calves significantly influenced their survival probability under harsh winter conditions (Citations). Cameron et al. (1993) determined that the probability of a successful pregnancy in caribou is largely predetermined at breeding, based on the autumn condition of the cow, and that early calf survival is influenced by maternal condition during late pregnancy. The scientific literature indicates that access restrictions to avoid displacement of elk from preferred habitats may be justified during the summer and autumn months (IDFG 2013).

Access management is often used to address increased vulnerability, declining habitat security, and declining habitat effectiveness. For instance, road and trail restrictions were frequently used on old logging roads to reduce vulnerability. Now OHV use on roads and trails are the greater concern as logging activities have been reduced on federal timber lands over the last 20 years and OHV use has continued to increase exponentially (IDFG 2013). However, both types of motorized disturbance must be considered.

7.3.2.8 Access and Recreation

"Security is important to elk year-round, and should be one of the basic tenets of elk habitat management" (Allen 1977). Security areas are those where elk are free from disturbance or can retreat when disturbance occurs on their usual range. Security is the product of a combination of factors that allow elk to remain in a specific area while under stress from hunting (Christensen et al. 1993) or other human disturbance (Citations). A suitable security area, as defined by Hillis et al. (1991) is 250 or more acres, having a non-linear shape, and being more than 0.5 mile from open roads. Hillis et al. also determined that more than 30% of a landscape should be dedicated to security.

Road and off-road trail density and pattern are important in determining the security an area provides to elk (Basile and Lonner 1979, Unsworth et al. 1998, Rowland et al. 2000).). Open roads decrease (size and effectiveness of) elk security areas and increase elk vulnerability (Leege 1984, Nez Perce Tribe 2001). Pedersen (1973) found that elk were unable to find secure habitat in heavily roaded and fragmented areas. Lyon (1979) suggested that security areas should provide a line-of-sight topographic barrier, be inaccessible to motorized traffic, and be at least as large as the area disturbed (Lyon 1979).

Roaded landscapes may contain few patches of forest cover large enough to function effectively as habitat for elk (Leege 1984 and Rowland et al. 2000). Roads, open or closed, dissect landscapes of forest and interior habitats into smaller patches of increased edge habitat. Declines in elk habitat use have been reported within 0.25–1.8 miles of open roads (Lyon and Christensen 2002). In addition to disturbance caused by traffic, roads remove about five acres of productive elk habitat per mile (Leege 1984). Lyon (1983) stated that the best method for attaining full use of habitats appears to be effective road closure.

Road closures are often used to increase elk security (Lyon et al 2000, Nez Perce Tribe 2001). Bull elk vulnerability has been documented to be highest in areas with open roads and lowest in roadless areas (Leptich and Zager 1991, Unknown 1996, Unsworth and Ferguson, Nez Perce Tribe 2001, Unsworth and Kuck 1991, Leckenby et al. 1991). Reducing open road density typically improves habitat effectiveness for elk during summer and may increase elk survival during hunting seasons (Leptich and Zager 1991, Vales et al. 1991, Nez Perce Tribe

2001). Irwin and Peek (1979) found that road closures allowed elk to stay in preferred habitats longer while elk in roaded areas were displaced. In western Montana, Marcum (1975) reported that elk use following road closures appeared about equal to that in similar unroaded areas. Edge (1982) reported that closed and lightly traveled roads were not avoided by elk in Chamberlain Creek. In Montana, Basile and Lonner (1979) reported that road closures reduced *en masse* elk movements to less accessible areas.

Lyon (1984) found a 53% reduction in elk use of habitat within the first 660 feet from a road and a reduction of use of habitat up to 28% at one mile from a road. The degree of disturbance and the amount of habitat affected varied by the density of vegetation adjacent to the road and whether hunting was occurring. Lyon (1979) reported that undisturbed timber and long distances across undisturbed drainages were not as effective as topography in reducing the distances elk moved away from human disturbances associated with logging. The distance from an open road avoided by elk has been reported as between 0.25 and 1.8 miles.

Leege (1984) reported that the amount of traffic is the determining factor for how much elk use would occur in habitat adjacent to roads; however, Thomas and Toweill (1982) reported that response by elk was dependent upon a combination of factors in addition to the amount of traffic, including the kind of traffic, quality of the road, and cover adjacent to the road.

The effects of roads on security areas can be mitigated by vegetation or topography. Edge and Marcum (1991) found that topographic barriers between a road and high-use elk areas or special habitats such as calving grounds mitigated the effects of disturbance. Pedersen et al. (1979) stated that ridge lines (as topographic barriers) were of prime importance in maintaining the integrity of security areas in Blue Mountain elk summer range in northeast Oregon.

Roads associated with timber management can adversely affect elk security long after harvest. Hunters often establish motorized use patterns that persist on roads constructed and maintained for current or future timber harvest. Closed roads provide access routes for hunters into areas that would otherwise be secure (Hillis et al. 1991). Some studies have recommended closing entire areas to motorized use, as opposed to individual roads, to best maintain healthy elk populations (Hurley 1994, Burcham et al. 1998, Rowland et al. 2005). Limiting or restricting use of roads, and the duration of disturbance and activities in adjacent drainages should be considered as elk management guidelines (Lyon et al. 1985, Edge and Marcum 1991, Pedersen et al. 1979) to minimize displacement and added energy costs of movement. The final report on the 15-year Montana cooperative elk logging study recommended closing roads to provide low road densities where elk habitat quality and security are important considerations (Lyon et al. 1985). Wisdom (2007) suggested:

- Addressing the effects of ATV use on elk in the same way as roads open to motorized traffic.
- Mitigating the effects of ATV trails in concert with road mitigation to minimize effects on elk.
- Assigning area closures to all motorized vehicle uses, combined with designation of open roads and trails and all other areas closed unless designated open.
- Narrow road and trail widths to effectively mitigate motorized traffic to maintain effective use of landscapes by elk.

7.3.2.9 Elk Population Status and Trends Based on Idaho Department of Fish and Game Elk Management Zones

IDFG establishes elk population objectives and manages harvest commensurate with habitat capabilities to maximize reproductive performance and overall herd health. Elk objectives are set by IDFG for Zones. Each Zone is comprised of one or more Game Management Units (GMUs) that roughly encompass a population. Elk populations are routinely monitored by IDFG to determine whether population objectives are being met for each Zone; IDFG may revise elk management to help meet population objectives. IDFG's annual Pittman Robertson (PR) Progress Reports on elk (and other species) provide insights into past and current herd health and population trends in management Zones across the Planning area. PR Reports also identify existing and potential biological and habitat issues that may cause changes in elk populations and, subsequently, elk management.

Palouse Zone

IDFG's Palouse Zone includes game management units (GMUs) 8, 8A, and 11A. A small fraction of Unit 8 is in the Planning area; 8A is mixed Forest Service and private/State ownership; none of Unit 11A is in the Planning area.

The Palouse Zone elk herd is highly productive and has shown substantial growth over the past several decades. Habitat conditions are favorable to elk due to timber harvest creating ample early seral habitat and agricultural crops that provide high quality forage.

Elk population growth in the Palouse Zone is limited primarily by social tolerance and elk depredation on agricultural crops. The population objectives for the Palouse include an increase cow numbers over the 1999 plan, but lower than current levels. IDFG's priority for the Zone is to maintain high harvest rates and to address social tolerance issues.

Elk populations in this Zone have increased over the last 30 years due to the increased availability of agricultural crops, natural forage, and brush-fields on both summer and winter range. Additionally, mild winters throughout the 1980s likely enhanced calf survival.

The 2004 survey in GMUs 8 and 8A revealed substantial growth of the cow elk population (>50%), while bull abundance declined (-25%). The most recent survey (2009) showed continued increases in cow numbers; however, bull numbers also increased, to the point that bull objectives have been met.

Elk productivity in this Zone is very high, with calf:cow ratios in the mid 40s or higher. This results in a resilient elk population and allows for a liberal hunting season length and harvest.

Idaho Department of Fish and Game Management Objectives

IDFG elk management objectives for the Palouse Zone are to establish a population of 1,125–1,725 cows and 115–415 bulls, at ratios of 18–24 bulls:100 cows and 10–14 adult bulls:100 cows. These objectives represent a reasonable balance between depredation concerns in the area and the desire to maintain a reasonably large elk population. The objectives represent the maximum number of elk that could be sustained within the constraint of social concerns.

Status and Trends

The Palouse Zone elk herd has been increasing for 10–30 years, and presently exceeds the cow abundance objective. Adult bull abundance and ratios were low in past years, but have recently improved to the point that most objectives are being met for bulls. IDFG expects Palouse elk herds to remain healthy (IDFG, Koehler. 2014. pers comm).

Issues

This Zone contains portions of the highly productive Palouse and Camas prairies. Currently, almost all non-forested land is tilled and only small, isolated patches of perennial vegetation remain, and those are regularly burned or treated with herbicides. Farmland in GMUs 8 and 8A provides high-quality elk forage, and as populations have grown, so have the number of crop depredation complaints. Farmers recall few elk depredation problems prior to the last decade or so. Elk currently cause damage to grain, legumes, rapeseed, canola, and hay crops throughout this Zone. Most of the crop damage occurs during summer months. Damage to conifer seedlings caused by elk is a concern where reforestation projects occur on elk winter range.

Timber harvest in the corporate timber, private timber, state land, and federal land areas of GMU 8A increased dramatically through the 1980s and 1990s, mostly to capture white pine mortality and respond to increased demand for timber products. This activity created vast acreages of early succession habitat, thus expanding and improving elk habitat potential.

Access in the Palouse Zone is high. Road construction associated with timber harvest is extensive in some areas; motorized trails are also extensive. Road closures in some areas have significant potential to benefit elk through improved habitat effectiveness and reduced harvest vulnerability.

Grazing by cattle occurs on almost all of the available pasture ground and poses some competitive concerns for elk, especially during drought years.

Increasing mountain lion harvest over the last few years likely reflects increased mountain lion numbers in this Zone. Black bear numbers appear to have remained static. Wolves are typically absent in most of the Zone but are becoming more numerous.

Lolo Zone

IDFG's Lolo Zone includes GMUs 10 and 12, almost all of which are in the Planning area. The southern portion of the Zone is within the Selway-Bitterroot Wilderness Area.

Idaho Department of Fish and Game Elk Management Objectives

IDFG elk management objectives for Lolo Zone are to establish a population of 7,400–11,000 elk; having ratios of 6,100–9,100 cows and 1,300–1,900 bulls, including 725–1,200 adult bulls. Cow and bull elk abundance objectives for the Lolo Zone were established by IDFG at levels to allow growth and recovery of these depressed populations over time. These objectives were set to levels believed to be sustainable by Lolo Zone elk habitat.

Status and Trends

The current elk population in the Lolo Zone is far below the IDFG objective of 7,400–11,000 elk. Elk calf to cow ratios have continued to decline since the early to mid-1990s, and have been at levels too low to sustain elk populations. More recently, cow survival rates have also declined to problematic levels. The most recent survey in the Lolo Zone (2010) revealed 1,358 cow elk and 594 bull elk; thus, bull elk and cow elk numbers were both well below objectives.

Issues

A number of factors have been identified as contributors to the decline of Lolo Zone elk populations. Declining habitat conditions caused by a shift from early seral forest stages to much less productive mid- to late-seral stages have been a source of concern for decades. More recently, the spread of noxious weeds (especially spotted knapweed) has also contributed to the decline in elk habitat quality, particularly in the Selway Zone. A major winter event in 1996–1997, with record snowfall more than 200% of normal, caused a severe winter die-off that resulted in an exacerbation of the population decline. White et al. (2010) documented heavy predation on neonate elk calves by black bears as additive and the primary proximate mortality factor of neonate calves (age ≤ 90 days). Additionally, predation by mountain lions was prevalent on all age classes of elk (Zager et al. 2007a,b; White et al. 2010). Currently, wolves, which were not present during the early portion of this elk decline, are a major mortality factor on older calves (≥6 months) and cow elk (Zager et al. 2007b, Pauley et al. 2009). Lower cow and calf survival due to wolves is continuing to suppress the elk population (Pauley et al. 2009, Pauley and Zager 2011, Horne 2012).

Dworshak Zone

The Dworshak Zone consists of GMU 10A. The eastern third of Unit 10A is in the Planning Area; the balance is mixed State, federal and privately managed land. Unit 10A is about three-fourths timberland and one-fourth open or agricultural land transected by canyons leading to the Clearwater River.

Idaho Department of Fish and Game Management Objectives

Objectives for Dworshak Zone are to establish a population of 2,900–4,300 cows and 600–900 bulls, with ratios of 18–24 bulls:100 cows and 10–14 adult bulls:100 cows. The Zone cow harvest strategy was modified for the 2000 hunting season to address over-harvest. The current goal is a harvest of 90–110 cow elk, which would allow the population to reach objectives over time. B-tag sales were capped beginning with the 2002 hunting season to allow the Zone to move toward bull and adult bull objectives.

Status and Trends

Historically, GMU 10A has supported a productive elk population. Elk populations in the Dworshak Zone remain stable, despite the addition of wolves to this Zone and a relatively high elk harvest. However, low recruitment and low bull numbers are a concern in this Zone.

From 1992–1996, recruitment averaged 34 calves:100 cows. From 1997–1999, recruitment dropped to an average of 19 calves:100 cows. However, the 2001 and 2007 surveys revealed increases in recruitment to 30 calves:100 cows and 26 calves:100 cows, respectively. The most recent survey conducted in 2011 indicated that cow numbers increased from 3,236 to 4,280, while the number of calves remained the same, resulting in an estimated 20 calves:100 cows.

Bull numbers are below IDFG objectives and showed continued decline in recent surveys. Low bull numbers can be attributed to high motorized access, which translates to high bull vulnerability.

Issues

The first wave of timber harvest in this Zone occurred during the early 1900s and consisted mostly of removing the most valuable timber species and largest trees. During the 1970s, timber harvest increased fairly dramatically, and new roads provided access to previously inaccessible areas. In 1971, the Dworshak Reservoir flooded approximately 45 miles of the North Fork Clearwater River corridor with slack water and permanently removed thousands of acres of prime, low-elevation winter range for big game. During the early 1970s, only a few hundred elk were observed wintering along the river under the predominantly old-growth cedar hemlock forest. The timberland is owned predominantly by Potlatch Corporation, Idaho Department of Lands (IDL), and Forest Service.

Timber harvest occurs on most available timber ground and road densities are high throughout the Dworshak Zone. High open and closed road densities contribute to high elk vulnerability and low habitat effectiveness. During the 1980s and 1990s, timber harvest occurred on almost all available State and private land as demand for timber and management of these lands intensified. Despite habitat losses to inundation by Dworshak Reservoir, extensive logging along the river corridor improved winter range in this GMU. South aspect forests were cleared to provide timber products and incidentally provided elk quality winter range.

Depredations have increased on agricultural land within the past 10 years in this Zone due to increases in both deer and elk populations and changes in land ownership that reduced hunting opportunities. Elk cause damage to grain, legumes, and hay crops within the south central portion of this Zone during summer months; occasional damage to stored hay, silage, and winter wheat occurs during winters with heavy snow accumulation. Damage to conifer seedlings by elk is a concern in the remaining portions of this Zone where reforestation projects overlap with elk winter range. Controlled antlerless elk seasons have been successful in reducing the overall level of damage in this Zone.

GMU 10A supports a substantial white-tailed deer population, few mule deer, and a small moose population. The white-tailed deer population has increased dramatically over the past 20 years. Significant competitive interactions between white-tailed deer and elk may exist. However, the form and extent of those relationships is presently unclear.

Significant livestock grazing on rangeland in the southeastern portion of the Zone impacts elk habitat potential. Most of the livestock grazing occurs on habitats used by elk exclusively during winter months. Elsewhere in the Zone, range allotments are present on summer and winter habitat.

Hells Canyon Zone

The Hells Canyon Zone is comprised of GMUs 11, 13, and 18. None of Unit 11 is within the Planning Area; a small portion at the south end of Unit 13 and two-thirds of Unit 18 are within the Planning Area.

This Zone contains large tracts of both private and publicly owned land, particularly within Unit 13 in the Planning Area. GMU 13 has been mostly under private ownership since settlement and is managed mostly for agriculture and livestock. Historically, sheepherders ran their flocks in the canyons of GMU 18 and some logging occurred in the forested areas of this GMU. GMU 18 is two-thirds public land with the remaining in private ownership, mostly located at lower elevations along the Salmon River. The majority of Hells Canyon Wilderness Area, which was designated as such in 1975, is in GMU 18.

Elk habitat productivity varies widely throughout the Zone from steep, dry, river-canyon grasslands having low annual precipitation to higher elevation forests with good habitat productivity and greater precipitation.

IDFG Elk Management Objectives

IDFG objectives for all 3 units of the Hells Canyon Zone are to establish a population of 2,000–2,900 cows and 420–610 bulls, including 240–348 adult bulls. Ratios of 18–24 bulls:100 cows are desired in GMU 1, and 30–34 bulls:100 cows in GMU 18.

IDFG management direction for the Hells Canyon Zone is to reduce the cow elk population to improve calf production, while maintaining the bull elk population at proposed objectives.

Status and Trends

Currently all of IDFG’s elk population objectives in the Hells Canyon Zone are being met or exceeded. Across the Zone, survey data indicate that cow and bull elk are increasing, with stable calf recruitment. However, the most recent surveys indicate that the Hells Canyon elk population may be at or exceeding the capacity of the habitat. IDFG increased harvest permit levels in 2009 in all Hells Canyon GMUs to slow or cap population growth, with an emphasis on reducing antlerless elk to address this concern.

Issues

Elk City Zone

The Elk City Zone is comprised of GMUs 14, 15, and 16. Land ownership in this Zone is approximately 80% public with the remaining 20% private. Most of the privately owned portions are at lower elevations along the Clearwater and Salmon rivers. Approximately 8% of this Zone is wilderness.

IDFG Management Objectives

IDFG objectives for Elk City Zone are to establish a population of 3,150–4,650 cows and 675–1,000 bulls, including 350–575 adult bulls (at ratios of 18–24 bulls:100 cows and 10–14 adult bulls:100 cows).

Status and Trends

Overall, Elk City Zone elk populations appear to be stable. IDFG’s objective for cows in the Elk City Zone has been met since 2008 and cow elk numbers are stable to slightly increasing across the Zone. Numbers of bull elk are increasing toward meeting objectives. Bull:cow ratios ranged between 12.9 and 13.6 on 2000 surveys.

Historically, calf recruitment in GMUs 14 and 15 was high, averaging 38 calves:100 cows from 1987–1993. However, the 2000 surveys revealed recruitment of 25 calves:100 cows, suggesting that a decline in recruitment may be occurring. This decline is similar to what has been observed in surrounding areas. This trend in low calf recruitment continued to be evident in the 2008 surveys. Chronic low recruitment is particularly a concern in GMU 16, which averaged 19 calves:100 cows from 1990–2000 and fell to 17:100 in 2008.

Issues

Habitat productivity varies between Elk City Zone GMUs. Unit 14 habitat quality is relatively high in comparison to most other Clearwater region big game Zones. Productive conifer forests with intermixed grasslands characterize the majority of this Unit. However, Unit 15 and 16 habitat is poor primarily due to loss of early succession vegetation and increasing forest overgrowth with lodgepole pine and fir due to fire suppression during the past 40 years.

Invasive weeds, especially yellow star thistle and spotted knapweed, have increased within the past 15 years and, in some parts of the Zone, are out-competing native grasses and forbs on important elk habitats.

Road and trail densities are high within the Zone, contributing to significant big game vulnerability.

Depredations have increased within the past 10 years in this Zone due to increases in both deer and elk populations and changes in land ownership that reduce hunting opportunities. Livestock operators are concerned with elk use of pasture and rangeland forage during spring months prior to release of livestock on these grounds. Some damage to grain crops occurs during summer. Several past fencing projects have helped to reduce concerns of elk damaging stored hay during winters with heavy snow accumulation.

Livestock graze much of this Zone on both private and public land. On private land on the west side of GMUs 14 and 16, competition with domestic livestock may be significant, especially during winter.

Mountain lion and black bear abundance appears to have remained relatively stable over the past decade. Wolves are well established in the Zone; but, at the same time, harvest of wolves in the Zone is the highest in the state. Predators are a factor in determining Elk City Zone elk populations, but are not thought to be a limiting factor at this time (IDFG, Koehler, personal comm. 2014.)

Selway Zone

The Selway Zone is comprised of GMUs 16A, 17, 19, and 20. These Units are almost entirely under Forest Service management. Approximately one-half of Unit 20 lies within the Frank Church-River of No Return Wilderness; approximately three-quarters of Unit 19 are in the Gospel Hump Wilderness.

IDFG Management Objectives

IDFG elk management objectives in Selway Zone are to establish a population of 4,900–7,300 cows and 1,050–1,550 bulls, including 600–900 adult bulls. Ratios of 18–24 bulls:100

cows are desired in the short term, returning to 14–18 adult bulls:100 cows when total elk populations reach desired objectives.

Elk numbers are currently well below management objectives in the Selway Zone. The most recent Selway Zone elk survey data (2007) shows 3,381 cow elk and 934 bull elk.

Status and Trends

The elk population in the Selway Zone has a similar history to that in the Lolo Zone, and the population is following the same downward trajectory. Elk calf to cow ratios have continued to decline since the early to mid-1990s and are currently at levels too low to sustain elk populations. More recently, cow survival rates have also declined to problematic levels.

Survey data collected by IDFG in this Zone from 1987–2001, revealed both declining numbers of adult elk and declining recruitment. Declining calf recruitment was initially detected in GMUs 16A and 17 in 1995 surveys. The 1996–1997 winter was severe, with deep snow exceeding 200% of the average in some areas. These conditions apparently caused higher-than-normal winter mortality, leading to a significant decline in GMU 16A and 17 populations. Survey data in 1999 suggested a 27% decline in adult elk over both GMUs. Elk population composition surveys in GMU 17 during 2002 and 2003, and a survey in 2004 revealed stable, low recruitment at 16 calves:100 cows, but in 2005 recruitment again declined to 11 calves:100 cows. 2004 surveys in GMU 16A revealed higher recruitment than in 1999; however, 2007 surveys showed further declines in recruitment in Units 16A and 17. Low calf recruitment was not observed in GMUs 19 and 20 until 1996.

Survey data in 2001 suggested a significant decline in GMU 20 elk, but a significant increase in GMU 19 elk. However, fire activity during summer/fall 2000 may have caused many animals to move to adjacent habitat, resulting in shifts in elk distribution among GMUs 19, 19A, 20, and 20A. The 2007 survey showed declines in total numbers of elk in all the Selway Zones, inferring that shifts of the population among Zones probably accounted for increased 2001 counts in some Zones.

Issues

IDFG has identified habitat and predation as the two primary limiting factors for Selway Zone elk.

Habitat productivity varies throughout the Zone from high-precipitation forested areas along the lower reaches of Selway River to dry, steep, south-facing ponderosa pine and grassland habitat along the Salmon River. Many areas along the Salmon River have a good mix of successional stages due to frequent fires within the wilderness; however, fire suppression within portions of the Selway River drainage has led to decreasing early seral forage production for big game. Declining habitat conditions caused by a shift from early seral stages to much less productive mid to late-seral stages have been a source of concern for decades. More recently, IDFG has identified noxious weeds as the primary habitat issue in the Selway Zone, particularly spotted knapweed that has encroached upon many low-elevation areas of elk winter range, competing with native forage.

Little data exist on predation in the Selway Zone, but strong similarities of Selway elk to elk population history and trajectories in the Lolo Zone suggest that predation effects are comparable. Predation on neonate elk calves by black bears is additive and a primary cause of mortality of neonate calves (age ≤90 days). Predation by mountain lions is expected to be prevalent on all age classes of elk (Zager et al. 2007a,b; White et al. 2010). Currently wolves, which were not present during the early portion of the Selway elk population decline, are an additional mortality factor on calves older than 6months and cow elk (Zager et al. 2007b, Pauley et al. 2009). As in the Lolo Zone, lower cow and calf survival due to wolf predation is likely continuing to suppress the elk population.

Road densities are low, contributing to low vulnerability for big game. Due to the rugged and remote nature of most of the land within this Zone, human impacts have been very limited.

7.4 Furbearers

7.4.1 *Importance in the Planning Area*

Furbearers are defined as a group of mammals trapped or hunted for their fur. Furbearers provide both recreational and economic benefits to the Plan Area. Trapping and hunting of furbearers are traditional activities that can be traced to the earliest history of Idaho and the Planning Area. Some furbearers, like river otters, are also popular for viewing when the opportunity arises. Beavers create valuable habitat for fish and wildlife. On the converse, some furbearers can and do cause property damage.

Furbearers found in the Planning Area include badger, beaver, bobcat, coyote, American marten, mink, muskrat, river otter, raccoon, red fox, spotted skunk, striped skunk, and weasel. (Grey wolves are also hunted and trapped in Idaho but are managed as big game and are discussed in Section XXX.) Lynx, fisher, and wolverine are also considered furbearers, but hunting and trapping for those species is currently prohibited in Idaho; those species are discussed in Section XXX.

The Idaho Department of Fish and Game (IDFG) manages furbearers primarily using licensing, harvest seasons, and harvest limits. Mandatory trapping and hunting harvest reports are used to estimate trends in furbearer populations and to determine the market value of the furbearer harvest. It is not possible from IDFG data to determine what portion of the harvest or market value comes from the Plan Area. However, it is clear from harvest reports that, by a wide margin, most of the IDFG Region 2 furbearer harvest and market value comes from Clearwater and Idaho counties. Those two counties are comprised mostly of Forest Service land, much of which provides excellent habitat for furbearers and opportunity for trapping. Latah County, which also has substantial Forest Service property, is third in both categories, but substantially less than Clearwater and Idaho counties.

The 2012–2013 total market value of all furbearers harvested in IDFG's Region 2 was $115,096; however, most of the Forest Plan Area harvest would have occurred in Clearwater and Idaho counties. The total market value of furbearers in Clearwater and Idaho counties for the 2012–2013 season was $94,746. Bobcat and marten were, by far, the most valuable furbearers in the Plan Area in 2012–2013, having combined market values from Idaho and Clearwater counties of $53,793 and $34,391 respectively (Crea 2013, IDFG unpublished data).

7.4.2 *History, Status, Trends*

Licensed trappers are required to report to IDFG the number of wild animals they catch, kill, and pelt during the open season and the amount received for the sale of these pelts. Trappers are also required to report non-target species (any species for which the season is closed). IDFG uses this information to estimate statewide harvest of furbearers by licensed trappers, the distribution of the harvest, and the market value of the state's furbearer harvest.

IDFG harvest reports from 1993 to 2001 included questions on how many days the trapper spent afield scouting and setting or checking traps, and how many hours, on average, the trapper spent afield each day. These questions were used to gather information on trapping effort. Results of this information were then projected to estimate the statewide trapping effort both in total hours and days afield.

Beginning with the 2002–2003 trapping season, these questions were changed to include Catch-Per-Unit-Effort (CPUE). CPUE measures the harvest per unit of time and is useful in predicting population trends. It is based on the premise that as populations decline, fewer animals are available to be trapped so CPUE should decline. The inverse is also true; CPUE would increase as populations increase. CPUE is calculated by multiplying the total number of nights trapped by the average number of traps set per night (for a given species) and then dividing the number of animals trapped by this number. CPUE is recorded as animals trapped per 100 trap nights.

IDFG collected data on how many days the trapper spent afield scouting and checking traps, and how many hours, on average, the trapper spent afield each day from the 1993–1994 season through the 2001–2002 season. CPUE data has been collected since the 2001–2002 season.

Statewide population trends over the last five years are stable to increasing for muskrat, otter, and spotted skunk. Statewide population trends over the last 5 years are stable to slightly decreasing for badger, bobcat, coyote, and mink. Trends over the last five years were down for beaver, marten, raccoon, red fox, striped skunk, and weasel. Badgers, skunks, and weasels are usually trapped incidentally to trapping for other species. Some trappers trap specifically for otters, but otters are also trapped incidental to beaver trapping. Many trappers, who report harvest of badgers, skunks, weasels, and sometimes otters, do not report trap nights or traps set for these 4 species since they are trapping for other species. Therefore, CPUE may not be an accurate reflection of population trend for badgers, otters, skunks, and weasels.

Bobcats**—**IDFG collects additional data on bobcats. Bobcats are among those furbearers that are both hunted and trapped. Since the 1981–1982 season, trappers and hunters have been required to have all bobcats tagged by the Department within 10 days after the close of the trapping/hunting season. Trappers and hunters are required to present the pelts of all bobcats to a regional office or official checkpoint to obtain the appropriate pelt tag and complete a harvest report. Information on the harvest report includes the animal's sex, harvest location, date harvested, method of take (trapping, calling/hunting with hounds, incidental hunting), and beginning with the 2002–2003 season, CPUE. Mandatory harvest report data continue to be used to estimate the total statewide bobcat harvest by IDFG region and Game Management Unit (GMU).

Table 7-1. Annual combined furbearer catch per unit effort, 2002 – 2012.

Trapping Season	CPUE = a/(b*c)*100
2002–2003	1.19

2003–2004	1.31
2004–2005	0.69
2005–2006	0.78
2006–2007	0.93
2007–2008	0.70
2008–2009	0.69
2009–2010	0.75
2010–2011	0.59
2011–2012	0.56
2012–2013	0.57

***River otters*—**Additional data is also collected on the river otter. The first river otter trapping season since 1972 was authorized during the 2000–2001 trapping season. A statewide quota of 100 otters was set. Once the regional quota was reached, trappers had 48 hours in which to have additional otters tagged, with a maximum allowable harvest statewide set at 121 otters. The harvest quota was changed to 102 animals for the 2002–2003 and 2003–2004 trapping seasons; and an individual trapper's quota was decreased from 5 to 2 river otters. Harvest quotas for the Planning Area have remained the same through the 2011–2012 season.

Trappers are required to have all river otters tagged by IDFG within 72 hours of harvest or to report their harvest to IDFG within 72 hours and make arrangements for tagging if special or unique circumstances exist.

Table 7-2. Bobcat catch per unit effort, 2002 – 2013.

Trapping Season	CPUE = a/(b*c)*100
2002–2003	3.37
2003–2004	0.93
2004–2005	1.94
2005–2006	3.48
2006–2007	1.20
2007–2008	1.88
2008–2009	6.20
2009–2010	2.38
2010–2011	14.93
2011–2012	1.45
2012–2013	0.75

7.4.3 *Issues and Concerns*

Furbearers receive little, if any, consideration when designing habitat management projects (IDFG Furbearer Mgt Plan, 1991–1995).

The value of beaver activity, though recognized, has not been utilized as a management tool to benefit fish and wildlife in Idaho.

Furbearers can and do cause property damage.

7.5 MOOSE

7.5.1 *Importance in the Planning Area*

Moose are an important big game animal in the Planning Area. Moose are managed by the Idaho Department of Fish and Game (IDFG) as a trophy big game species, using highly sought-after controlled hunts to limit harvest to allow continued expansion of populations across most of the Planning Area.

Moose in the Plan Area are in the very southern extent of their range. Their populations depend almost entirely on National Forest managed habitats. Moose in the Plan Area exhibit two life strategies: Some populations are found in climax vegetative cover. Their summer feeding habits tend to be nocturnal in open, wet meadows, while diurnal activity is limited to adjacent forested areas. Logging may reduce habitat for these populations. Winter habitat selection favors subalpine fir and Pacific yew plant communities. Other populations in the Planning Area are adapted to early seral plant communities, except in winter. Winter ranges appear to be timbered areas where yew-wood thickets are several hundred years old. These populations may be expanding in areas where extensive habitat manipulation has resulted in early seral brush-fields; however, creating openings in these timber stands through logging may impact moose by reducing or eliminating yew-wood thickets.

7.5.2 *Status and Trends*

Moose in the Plan Area are usually counted incidental to elk surveys. However, many moose are not counted because elk surveys are seldom flown at elevations where moose normally winter and because moose tend to prefer dense subalpine fir plant associations for winter habitat where they are less conspicuous. As a result, no comparative population data have been regularly collected. An aerial sightability survey of moose in Game Management Unit (GMU) 15 was attempted in 2000; however, results were unsatisfactory because of overly large confidence intervals due to the extreme correction factors applied to animals detected under heavy canopy cover.

IDFG uses mandatory harvest reports and reported non-hunting mortalities to provide limited insight into moose population status and trends. Harvest levels, hunter success, and hunter days expended are determined from mandatory harvest reports. Moose hunt controlled permit numbers are adjusted by IDFG for the Planning Area to respond to changes in hunter success rates and/or antler spread, which reflect moose population trends.

Moose populations are in serious decline in some parts of the Plan Area, particularly from the Lochsa River south, and especially in the Selway River and South Fork Clearwater River drainages (GMUs 15, 16A, 17, 19, and 20). Recent direction in the number of moose hunting permits across the Plan Area reflects the serious declines in moose populations in those Units over the past several years. Additional cuts in permits are likely in coming years.

Even as some moose populations in the Plan Area are suffering drastic declines, the population in other parts of the Plan Area appear to be increasing, apparently in response to extensive habitat alteration by silvicultural and agricultural practices that increase early seral browse favored by moose. Moose populations in these areas, however, typically have shown surges followed by declines.

7.5.3 *Issues and Concerns*

More intensive investigation of moose population levels, trends, and habitat selection and use are needed across the Plan Area.

The cause of the decline in moose in the southern parts of the Plan Area are not known at this time. Some part of the decline can probably be attributed to increased predation by wolves; however, moose populations are not showing the same rate of decline in the Lolo Zone and other northern GMUs where wolf densities and predation are higher. There is some current speculation that climate change may be contributing to impacts from parasites and diseases on moose, but confirmation is needed; research is currently being conducted in Minnesota on the effect of climate change on moose. IDFG started collecting tissue and other samples from harvested moose in 2013 in effort to find a cause for local declines.

Some moose populations may be displaced or eliminated because they cannot adapt to habitat changes, particularly where yew-wood thickets are reduced or eliminated through logging and where increased road densities make moose more vulnerable to harvest.

The effects of the recent expansion of wolves across the region on moose populations are as yet undetermined. In 2008, IDFG began monitoring moose in GMU 10 that were captured and radio-collared to determine mortality rates and causes of death in the presence of wolves. This work is being done in conjunction with ongoing wolf-elk interaction research in the Lolo Zone. A total of 12 radio collars were placed on yearling or adult moose during the 2008–2009 winter. Eleven of the 12 collared animals survived the first year. The lone mortality was a young bull that was harvested by a hunter in Hunt Area 10-3 in 2009. One additional radio collar was deployed in January 2010. Again, 11 of the 12 collared animals survived the year. The one mortality was a bull that was injured while sparring with another bull during the rut. In February 2011, an additional 22 moose were captured and radio-collared (2 bulls, 8 cows, and 12 calves). By early 2012, wolves had killed 1 adult cow moose and 6 calves. While results are very preliminary, to date wolves have not proven to be a significant cause of mortality on radio-collared adult moose. However, if early trends in wolf-caused calf mortality continue, calf survival and recruitment could become an issue.

Improvements in habitat and reductions in predation would be expected to increase white-tailed deer, mule deer, and moose populations that rely solely on National Forest habitats.

7.6 MOUNTAIN GOAT

7.6.1 *Importance in the Planning Area*

Recreational opportunities associated with mountain goats include hunting and wildlife viewing, although opportunities to view and photograph mountain goats in Idaho are limited. Most people are unwilling or unable to climb into the steep and often remote country that goats occupy. The Idaho Department of Fish and Game (IDFG) has identified Mallard-Larkins Pioneer Area and Upper Trail Creek (Pope 2003) as popular with the public for mountain goat viewing in the Plan Area. Recreational interest may have adverse impacts on mountain goats because goats are sensitive to disturbance.

Mountain goats are hunted in the Plan Area, but on a very limited basis. A hunter is allowed only one opportunity to hunt for mountain goats in his lifetime but demand for a mountain goat hunting opportunity is high, with 400–500 applications submitted for the 40–50 mountain goat permits available annually statewide.

Many of the historic mountain goat hunting areas in the Clearwater region are currently closed to hunting because of low population levels or loss of mountain goats entirely from previously occupied ranges.

7.6.2 *Biology*

Mountain goats (*Oreamnos americanus*) are restricted to North America. All mountain goats are considered to be a single species. Mountain goats are not true goats, but are grouped with the ghoral and serow of Asia and the chamois of Europe into the tribe *Rupicaprini,* referred to as ”goat-antelopes” (Eisenberg 1981).

Both male and female goats have horns, although they have subtle differences in size and shape; horns are not present until 2 years of age. Adult males are generally 10–30% larger than adult females (Brandborg 1955, Houston et al. 1989) and males appear stockier or heavier in the chest and shoulders than females and the beards of males are heavier and broader than those of females. During breeding season, males urinate on themselves and paw dirt onto their body, giving them a dirty appearance. Adult males 2 years and older are normally solitary or with small groups of other males. Generally, adult animals alone and away from the nanny-kid-yearling herds are adult males, although this isn’t always the case (B.L. Smith 1988, Hibbs 1965). In some instances, the stage of hair molt can be used to determine sex and reproductive status (Brandborg 1955, Chadwick 1983). Adult males are the first to begin (usually in May) and complete shedding their winter coat, while nannies with kids are the last, often not shedding until August. Both males and females possess glands at the base of their horns thought to be used in mating behaviors (Geist 1964). Upon close examination, these glands are more prominent in males.

Nannies are dominant in mountain goat social structure.

Mountain goats typically select steep slopes and adjacent alpine areas at 4,500 to 8,000 feet in elevation, and occupy subalpine and alpine habitats where trees are either absent or scattered (B.L. Smith 1977). However, mountain goats winter near sea level in the rugged ranges of southeast Alaska and British Columbia (Hebert and Turnbull 1977), and occur at elevations >12,000 feet in Colorado’s Rocky Mountain Range (Hibbs 1967). Many goat populations have average group sizes of 5 or less (Hebert and Wood 1984, Varley 1996, Poole et al. 2000) However, goats tend to congregate in larger groups in late spring to early summer as they stage on windswept, grassy plateaus before moving to summer range at higher elevations.

Habitats selected by mountain goats are often characterized by harsh climates having frequent strong winds, high snowfall, and snow accumulations persisting more than 8 months annually. Mountain goats may move to lower elevations to escape the most severe winter weather, but often winter in small, protected micro-habitats characterized by steep snow-shedding slopes where high winds preclude snow accumulation and south-facing slopes that warm quickly when exposed to the sun. In some habitats, wind actions reduce snow cover at higher elevations, and in these areas, mountain goats may winter at higher elevations than used during summer months.

Mountain goats are intermediate browsers, feeding primarily on grasses during the summer (Laundré 1994). Alpine shrubs and browse constitute nearly half of the summer diet. Grass is also used preferentially during fall and winter when it is exposed. However, in areas where grasses are covered by snow, mountain goats readily switch to a diet of browse including mountain mahogany (*Cercocarpus ledifolius*) and conifers such as Engleman spruce (*Picea englemannii*) and subalpine fir (*Abies lasiocarpa*). Where available, mosses and lichens may also be selected (Cowan 1944, Harmon 1944, Casebeer 1948, Brandborg 1955, Saunders 1955, Geist 1971, Hjeljord 1971, Peck 1972, Hjeljord 1973, Bailey et al. 1977, Adams 1981, Adams and Bailey 1983, Fox and Smith 1988; *for reviews, see* Laundré 1994, Côté and Festa-Bianchet 2003).

Perhaps due in part to the shallow, undeveloped soils typical of many mountain goat habitats, mountain goats appear to be very sensitive to nutrition level and availability of supplemental minerals. B.L. Smith (1976) reported a correlation between female nutrition and kid:nanny ratios, and Bailey (1986) reported that availability of summer forage was related to pregnancy rate. Fox et al. (1989) reported that winter forage was critical both to adult over-winter survival and fetal development. Mountain goats may travel long distances to obtain trace minerals from the soil at natural or artificial mineral licks (Hebert and Cowan 1971, Adams 1981, Singer and Doherty 1985, Hopkins et al. 1992), and may be particularly susceptible to selenium deficiency (Hebert and Cowan 1971).

As habitat specialists, mountain goats evolved to occupy steep rocky terrain where there was little competition with other ungulates for forage and little risk from predators. However, such a predator-avoidance strategy inevitably limits the size of mountain goat populations (Geist 1982). If mountain goats are limited by distance to escape cover, only a fixed amount of habitat is available; and increases in population size must be associated with reduced resources available per animal or population density. To avoid over-crowding, mountain goats must defend individual territories. Further, to maximize reproductive fitness in a polygamous mating system, females and their offspring must be able to select the best and most secure habitats. All of these hypotheses appear to apply to mountain goat populations (IDFG IDFG Draft Mountain Goat Management Plan 2006).

Population fitness can be optimized by strategies that include maximizing the amount of area used daily and seasonally (i.e., relatively large daily movement patterns and seasonal migrations) and behaviors that segregate areas used by females and kids from those used by males. Nursery groups made up of females and their offspring, including males to 2 years of age, typically move greater distances daily (2–5 km/day) than males (<1 km/day) (Singer and Doherty 1985, Côté and Festa-Bianchet 2003). Females were reported to move nearly twice as far each day (~1 km) as males (Singer and Doherty 1985), and to have much larger home ranges (25 km^2 compared to 5 km^2 for males) in Alberta (Côté *in* Côté and Festa-Bianchet 2003), although such a large discrepancy was not noted in some other studies (Rideout 1977, Singer and Doherty 1985).

Seasonal migrations of mountain goats have been widely reported where more-or-less continuous habitat exists. Most commonly, seasonal movements result in the animals moving to lower elevations at or just above tree-line or slopes with southern exposures (Brandborg 1955, Hjeljord 1973, B.L. Smith 1976, B.L. Smith 1977, Rideout 1977). In coastal Alaska and British Columbia, mountain goats may descend to near sea level and winter in coniferous forests (Hebert and Turnbull 1977, Fox 1983).

In summer, males may venture into forested areas away from steep slopes to feed, while females and kids usually feed on or in immediate proximity to steep slopes used to escape potential predators. Even during winter, the sexes may separate. Males may occupy areas with deeper snow than females, and individuals of either sex may select a favorable microhabitat, like a monolith or rocky slope surrounded by timber, and over-winter individually in tiny seasonal home ranges of 0.5 to 1.5 km^2 (Keim 2004).

In addition to such repeatable movements associated with daily foraging, trips to mineral licks outside of normal home range areas, and seasonal migrations, mountain goats may make extended "exploratory" movements through unoccupied terrain. Although young males ages 1–3 are most likely to disperse into unoccupied habitats (Stevens 1983), adult animals of either sex may make such moves. These movements often take the form of searching for apparently suitable habitats visible from occupied habitat; that is, an individual animal of either sex may move from an occupied habitat to a visible rocky monolith or step slope, passing through miles of forested land to do so.

The ability of mountain goats to cross apparently unsuitable low-elevation and forested terrain to establish new populations was recently documented by Lemke (2004) in southern Montana, where mountain goats have expanded their range into a previously unoccupied area (the Gallatin Mountain Range) and southward into Yellowstone National Park in Wyoming. Another well-documented example is the colonization of the Olympic Peninsula (Houston et al. 1994).

As habitat specialists, mountain goats are superb colonizers (Kuck 1977, Adams and Bailey 1982, Swenson 1985, Kuck 1986, Houston and Stevens 1988, Hayden 1989, Houston et al. 1994, Lemke 2004). Mountain goats readily adapt to new habitats following transplants, and they readily colonize habitats formerly inaccessible because of snow and ice cover (i.e., retreating glaciers and snowfields) or vegetation (occupying burned-over habitats formerly forested). In these situations, mountain goat populations typically exhibit high pregnancy and twinning rates associated with a high plane of nutrition and high rates of survival. During the initial expansion phase of population growth, the annual growth rate in Idaho was 22% (Hayden 1989). Similarly rapid population increases following transplants have been noted in North Dakota, Oregon, Utah, and Wyoming.

The period of initial expansion is followed by a period of population stabilization as available habitat becomes fully occupied and density-dependent factors begin limiting further population expansion. This expansion is then followed typically by a phase of population decline as mountain goats become limited by food resources, predators, and diseases (Caughley 1970). Older populations persist at some "post-decline" level dictated by range conditions (Bailey 1991), weather, predators, and disease. Data from Idaho (Toweill 2004) indicates that this cycle, from transplant to post-decline, may occur over a period of 30–40 years.

7.6.3 *Population Biology*

Mountain goats breed between early November and mid-December (Geist 1964), with males moving among groups of females and tending estrous nannies for 2–3 days (DeBock 1970, Chadwick 1983). In some populations, nannies reach sexual maturity at age 2 and produce their first kid at age 3 (Peck 1972, Stevens 1980, Bailey 1991), while in other populations age at first breeding is 3 years (Festa-Bianchet et al. 1994). This delay in sexual maturity dramatically reduces the potential for rapid growth in mountain goat populations (Lentfer 1955, Hayden 1990). Twinning rates are generally low, but can be higher in expanding populations on good ranges (Holroyd 1967, Hibbs et al. 1969, Hayden 1989, Foster and Rahs 1985, Houston and Stevens 1988). Nannies rarely bear triplets (Hayden 1989, Hanna 1989, Lentfer 1955, Hoefs and Nowlan 1998).

Mountain goat kids are precocious and begin to forage and ruminate within days after birth (Brandborg 1955, Chadwick 1983). After approximately 2 weeks of seclusion, nannies with new kids form nursery groups with other nannies and kids, which often include yearlings. During this period, 2 year-old billies generally leave the nursery herd and remain solitary or form small groups of males. Kids remain with their mothers through their first winter and, although the presence of the mother is thought to increase survival of kids, orphaned kids can survive (Foster and Rahs 1982). Once sexually mature, reproductive success generally increases and peaks at 8 years of age, at which point it declines (Stevens 1980, C.A. Smith 1984, Bailey 1991).

7.6.4 *Mortality*

Mountain goats have adapted to harsh environments through a strategy that focuses more on the survival of individual goats than on production of offspring (Hayden 1990). Severe winters and their impact upon availability of winter forage and energy expenditure have been frequently hypothesized as the primary factor leading to mortality among mountain goats (Dailey and Hobbs 1989). A negative correlation has been found between snow depth and kid:adult ratios (Adams and Bailey 1982), while a positive relationship was found between reproductive rates and total winter precipitation 1.5 years prior to birth (Stevens 1983). In Alaska, severe winters were correlated with poor reproduction the following spring (Hjeljord 1973).

Documented annual mortality rates in Alaska were 29% for yearlings, 0–9% for age classes 2–8, and 32% for goats older than 8 years (C.A. Smith 1986). Goats older than 8 died primarily from predation or other natural factors, while hunting was the primary cause of mortality among prime-aged goats. Annual mortality in Alberta was 28% for yearling males and 16% for yearling females (Festa-Bianchet and Cote' 2002). Mortality of males from 4–7 years was 5% but increased dramatically after 8 years. Between ages 2 and 7, mortality of females was 6%. As a result of mortality and emigration, only 39% of yearling males were still present in the population as 4 year olds. In a rapidly growing population in Idaho, kid mortality was only 12% and yearling mortality only 5% (Hayden 1989). Forty percent mortality was documented among marked kids in the Black Hills of South Dakota; yearling and older goat mortality was estimated to be 14% (Benzon and Rice 1988).

Mortality of young goats can be high during their first winter. Kid and yearling mortality during a severe winter was 73% and 59%, respectfully, while only 27% and 2%, respectively during a mild winter (Rideout 1974). During a series of severe winters in Colorado, kid mortality reached 56% and kid:adult ratios dropped from 48:100 to 14:100 (Thompson 1981). Total population declines of 82–92% occurred following severe winters in coastal British Columbia (Hebert and Langin 1982).

Grizzly bears (Festa-Bianchet et al. 1994, Jorgenson and Quinlan 1996, Cote' and Beaudoin 1997), wolves (Fox and Streveler 1986, C.A. Smith 1986, Jorgenson and Quinlan 1996, Cote' et al. 1997), mountain lions (Brandborg 1955, Rideout and Hoffman 1975, Johnson 1983), coyotes (Brandborg 1955), golden eagles (Brandborg 1955, B.L. Smith 1976), and wolverines (Guiguet 1951) have all been identified as predators of mountain goats. In west central Alberta, juvenile annual mortality was 42%, with most mortality occurring prior to November (Smith et al. 1992). A total of 88% of this mortality was predation by wolves, grizzly bears, and mountain lions. A majority of kid mortality was attributed to grizzly bears (Festa-Bianchet et al. 1994). In Alaska, goat remains were found in 62% of wolf scats (Fox and Streveler 1986), while only 2% of wolf scats from Banff National Park in Alberta contained goat remains (Huggard 1993). In Yellowstone National Park researchers have documented 2 confirmed wolf kills of mountain goats out of approximately 3,000 confirmed kills (D.W. Smith, National Park Service, personal communication cited in IDFG Draft Mountain Goat Management Plan 2006).

7.6.5 *Diseases and Parasites*

Very few reports document infectious diseases in mountain goats, which is probably more a reflection of how little we know of this species than its actual health status. Because of their remote habitat preferences, sick or dead goats are rarely observed or found.

Most information about the parasite fauna of mountain goats comes from work in the 1950s to 1970s on a few populations in Canada (Alberta and British Columbia) and the United States (South Dakota, Idaho, and Montana). Recent investigation into the parasite fauna of mountain goats is slim, and in fact “there is currently insufficient information available to complete an accurate [health] risk assessment for this species” (Garde et al. 2005). Parasites and other pathogens previously identified in mountain goats are summarized in the appendices of Garde et al. (2005). Recent reviews of the parasite fauna of mountain goats include Hoberg et al. (2001) and Jenkins et al. (2004).

Mountain goats may commonly share parasite species with sympatric wild ungulates, including bighorn sheep (Samuel et al. 1977). For example, *Parelaphostrongylus odocoilei*, a muscle-dwelling roundworm, may be transmitted among mountain goats, thinhorn sheep, and black-tailed deer, all of which could potentially share range in the coastal mountains of north central North America. Transmission of parasites, unlike most bacterial or viral pathogens, does not require direct contact; instead, shared range use (even seasonally) may result in transmission. This has implications for management (especially if animals are translocated), and may have significance for the health of these populations.

7.6.6 *Responses to Human Disturbance*

Recreational opportunities associated with mountain goat management include hunting and wildlife viewing. Demand for hunting opportunity is high, with 400–500 applications submitted for the 40–50 mountain goat permits available annually since 2000. Opportunities to view and photograph mountain goats in Idaho are limited for those unwilling or unable to climb into the steep and often remote country that mountain goats typically occupy. Viewing sites in the Plan Area include the Mallard-Larkins Pioneer Area, and Upper Trail Creek (Pope 2003). These sites are very popular with the public.

However, much winter recreation has high potential to adversely impact mountain goat populations. Mountain goats are more susceptible to disturbance by helicopters than most open-terrain ungulates; Cote (1996) reported that mountain goats exhibited overt responses to 58% of helicopter flights within 1.2 miles, and Gordon and Reynolds (2000) reported that mountain goats exhibited moderate to extreme response to helicopters during 75% of all sightings from the helicopter.

Winter disturbance is especially problematic, since mountain goats that are already stressed by cold and limited food supplies may exhibit panic, increased metabolic rates and energy expenditure, and reduced time spent feeding (Gordon and Reynolds 2000). Repeated disturbance by helicopters, snow machines, or even logging or road building (Chadwick 1983) may result in abandonment of favored habitats—steep cliffs that readily shed snow cover, allowing goats access to forage in an environment where they are normally secure from predators—potentially reducing probability of winter survival through increased energetic demand associated with feeding and increased exposure to potential predators.

Increased winter activity in the vicinity of mountain goat habitat, especially heli-skiing and over-snow travel by snowmobiles, has potential to severely reduce the amount of habitat that may be used by mountain goats (IDFG Draft Mountain Goat Management Plan 2006).

Anthropogenic disturbance of ungulates is postulated to have a variety of effects, including habitat abandonment, changes in seasonal habitat use, alarm responses, lowered foraging and resting rates, increased rates of movement, and reduced productivity (Pendergast and Bindernagel 1976, MacArthur et al. 1979, Foster and Rahs 1981, Hook 1986, Joslin 1986, Pedevillano and Wright 1987, Dailey and Hobbs 1989, Frid 1997, Duchense et al. 2000, Phillips and Alldredge 2000, Dyer et al. 2001, Frid 2003, Gordon and Wilson 2004, Keim 2004). Non-lethal disturbance stimuli, like helicopter or snow machine activity, can impact feeding, parental care, and mating. It can also significantly affect survival and reproduction through trade-offs between perceived risk and energy intake, even when overt reactions to disturbance are not visible (Bunnell and Harestad 1989, Frid and Dill 2002). Increased vigilance resulting from disturbance may also reduce the physiological fitness of affected animals through stress, increased locomotion costs, particularly deep snow conditions during winter, or through reduced time spent in necessary behavior such as foraging or ruminating (Frid 2003). Physiological responses, such as elevated heart rates, to disturbance stimuli may not be reflected in overt behavioral responses to disturbance (Macarthur et al. 1979, Stemp 1983, Harlow et al. 1986, Chabot 1991), but are nonetheless costly to individual animals and, ultimately, to populations.

The increasing use of aircraft near occupied mountain goat habitat is of particular concern to IDFG (IDFG Draft Mountain Goat Management Plan 2006). While the short-term, acute responses of mountain goats to helicopters has been documented (Côté 1996, Gordon and Reynolds 2000, Gordon 2003) and repeatedly observed by wildlife managers, the medium- and longer-term effects of aircraft activity on mountain goat behavior and habitat use remains unclear (Wilson and Shackleton 2001). Helicopter-supported recreation is increasing in or near occupied mountain goat habitats across North America, exacerbating concerns (Hurley 2004) regarding the long-term effects of such activity on mountain goats.

The degree to which aircraft overflights influence wildlife is thought to depend on both the characteristics of the aircraft and flight activities and species or individual specific factors (National Park Service 1994, Maier 1996 *in:* Goldstein et al. 2004). Recent studies have shown that management of approach distances may ameliorate behavioral disruption from helicopter activity (Goldstein et al. 2004). How flight vectors and topographic variables affect mountain goat short-term overt reactions to helicopters, however, remains poorly understood. The timing of disturbance is likely a key factor determining the strength of mountain goat overt disturbance reactions and the overall effect of helicopter activity on activity patterns; the potential impacts of helicopter activity on mountain goats must be considered in the context of the ecological season and time of year. Fox et al. (1989) found that winter was a period of severe nutritional deprivation for mountain goats; winter is thus of particular concern for the management of disturbance stimuli, because periods of deep snow can reduce food availability and increase locomotion costs (Dailey and Hobbs 1989). Fixed-wing aircraft and ground-based disturbances are generally thought to be less disruptive compared to helicopters (Foster and Rahs 1983, Pedevillano and Wright 1987, Poole and Heard 1998).

Ground-based recreation, particularly motorized recreation such as the use of ATVs and snowmobiles, can disrupt use of habitat by mountain goats or result in behavioral disruptions. IDFG is concerned about increasing over-snow motorized incursions into mountain goat wintering areas observed during elk survey flights. Increasing motorized winter access into winter habit has the potential to displace mountain goats from winter habitat, which is limited in the Plan Area. (IDFG, Hickey, 2014. Pers Comm)

Harvest can also affect mountain goats. Mountain goats seasonally occupy habitats associated with high timber values, particularly in coastal ecosystems (Hebert and Turnbull 1977). The most significant threat associated with forest harvesting is the removal of old and mature forest from goat winter ranges (Wilson 2004). A dense, mature coniferous forest canopy is required to intercept snow and to provide litterfall forage to sustain goats through periods of nutritional deprivation, particularly in coastal ecosystems (Hebert and Turnbull 1977). Forest harvesting may also disrupt dispersal movements, movements between seasonal ranges, and use of mineral licks accessed via traditional trails (Wilson 2004). Forest cover adjacent to traditional low-elevation trails is also considered important for visual protection from predators (Hengeveld et al. 2003).

Access to areas occupied by mountain goats via logging roads is a key factor in the success of goat hunters (Phelps et al. 1983). Proximity of roads to mountain goat habitat is the most important determinant of hunting pressure; hunters are generally deterred from hunting distances less than 2 km from roads (Hengeveld et al. 2003 *in:* Wilson 2004). The continuing expansion of roads and motorized trail networks is eroding the *de facto* protection provided by the remote terrain used by mountain goats (Wilson 2004). Increasing road access near mountain goat habitat has resulted in local extirpations due to hunting in several areas in British Columbia. Increasing road access during the 1960s in the Kootenay region, for example, led to over-hunting from which populations never fully recovered (Phelps et al. 1983 *in*: Wilson 2004). With reductions in mountain goat populations, including extirpation in certain locations, conservation efforts have resulted in hunting closures.

Although mountain goats generally inhabit remote and precipitous terrain, they also make use of critical, low-elevation features that put them in direct conflict with a number of land uses including forestry, road building, and mineral exploration. Because mountain goats travel long distances along traditional trails to access low-elevation mineral licks, industrial activity near trails and licks has the potential to disturb and displace goats from critical habitat features (Hebert and Cowan 1971, Hengeveld et al. 2003 *in:* Wilson 2004). Blasting activities associated with road construction, mineral extraction, or other industrial activities can also directly affect the suitability of mountain goat habitat by precluding use of critical escape terrain. Blasting might also disturb mountain goats during critical periods, such as kidding, or increase the risk of avalanches on winter ranges (Wilson 2004).

Mountain goats have a lower recruitment rate than other ungulates (Festa-Bianchet et al. 1994); mountain goats in some areas have been noted not to produce young until 4 to 5 years of age. Reduced fitness or vigor or indirect mortality resulting from disturbance may present a greater risk to mountain goat population viability compared to other ungulates, supporting the need for species-specific mitigation strategies to reduce disturbance effects (IDFG MGP). Previous studies have found that human displacement reduced elk reproductive success, supporting maintenance of disturbance-free areas during parturition periods (Phillips and Alldredge 2000). Nannies and kid mountain goats typically occupy remote, inaccessible portions of their home range during the kidding period in May/June (DeBock 1970, Chadwick 1973, Rideout 1978, Shackleton 1999, Gordon 2003) and may be at increased risk due to accidental mortality during this period. Because nannies are the dominant animals in the mountain goat social hierarchy and represent the potential for recruitment of new individuals into a given population (Chadwick 1973, Côté 1996), the effects of helicopter disturbance on adult female goats is of particular interest. Ungulates have been shown to be particularly sensitive to disturbance during parturition and early rearing of young (Penner 1988, Dyer et al. 2001). Given the highly synchronous birthing in mountain goats (DeBock 1970, Côté and Festa-Bianchet 2001) and the high fidelity of goats to the habitats they inhabit (Chadwick 1973, Fox 1983, Stevens 1983), development and application of mitigation measures for aerial disturbance near habitats occupied by nannies and kids should be feasible from a management perspective (Hurley 2004).

7.6.7 *Mountain Goat Population Status and Trends Based on IDFG Goat Management Zones*

IDFG goals for managing mountain goats in the Plan Area include increasing populations through conservative hunting seasons, capturing and translocation into vacant habitat or to augment existing populations, maintaining harvest and recreational opportunity, emphasizing non-consumptive values, inventorying all mountain goat populations at a maximum interval of 5 years, and collecting information on mountain goat diseases. In areas where populations have been severely reduced, no hunts will be offered until those populations recover to satisfactory levels. IDFG may utilize translocation to reestablish or augment mountain goat populations as mountain goats become available and approval with land management agencies can be acquired.

IDFG tracks mountain goat populations in designated Game Management Units (GMUs) using both population surveys and mandatory hunting reports.

7.6.7.1 GMUs 10, 12, 15, 16, 16A, and 17

Mountain goat habitat in GMUs 10, 12, 15, 16, 16A, and 17 is located mainly along the Idaho-Montana border and in rocky cliffs of North Fork Clearwater, Lochsa, and Selway river drainages. Nearly all of the land that supports mountain goats is under U.S. Forest Service (USFS) ownership and management.

Historically, mountain goats were hunted on a general-hunt basis in the Planning Area north of Salmon River. As a result, some of the easily accessible herds were over-hunted or eliminated. From 1966 to present, because of low mountain goat population numbers, all mountain goat hunts have been offered only as controlled hunts. Hunt areas were originally quite large, often including several discrete populations of mountain goats; however, in 1972, hunts were divided into smaller, more easily managed controlled hunts to regulate and to more evenly distribute hunting pressure. In general, the more accessible mountain goat populations still receive the brunt of the harvest.

Mountain goat populations are tracked by IDFG using both population surveys and harvest reports. GMUs 12 and 17 have not been surveyed since 1994 and 1996, respectively (Table 1 from PR report). A paintball, mark-resight survey of the Black Mountain (GMU 10) goat population was conducted during April and May 2010. Data from that survey suggested a slight increase in the mountain goat population since the previous survey in 2005 (Table 1). In 2005, 85 ± 17 mountain goats were observed over both hunt areas, compared to 100 ± 7 in 2010. Additionally, a survey was conducted in the old Blacklead hunt area (S.F. Kelly Creek to Williams Creek) in GMU 10 and the Boulder Creek/Crooked Fork in GMU 12. Forty-seven goats were observed in those survey areas, compared to 136 goats observed in 1996. The decline prompted a decision to suspend future translocation removals from that area.

Mountain goat harvest levels have changed little in the Planning Area during the last 10-year period. GMU 10-2 was closed to mountain goat hunting in 1997 due to the decline in mountain goat numbers revealed by a 1996 survey. After observing substantial numbers of goats during later elk surveys, a separate goat survey of this area was conducted in 2010. Sufficient numbers of goats were observed in this area to reinstate the Unit 10-2 hunt with 2 tags.

Lack of mountain goat population growth in Hunt Area 10 will lead to more conservative and cautious management to avoid over-exploitation.

7.6.7.2 GMUs 14, 18, 19, and 20:

The deep, rugged canyons of the Snake and Salmon rivers dominate the topography of GMUs 14, 18, 19, and 20. Mountain goat populations in this area are found almost exclusively in habitat designated as wilderness managed by USFS. Mountain goats in GMU 18 are found in the Seven Devils area, while those in GMUs 19 and 20 are found on the breaks of the Salmon River in the Gospel Hump and Frank Church-River of No Return wilderness areas. Habitats in both areas are generally drier and more open than mountain goat habitat found in GMUs 10 and 17.

A paintball mark-resight survey was conducted in GMUs 18 and 22 in April and May 2007; an estimate of 194 **±** 29 goats was obtained. Using the same technique in 2002 generated an estimate of 196 **±** 22 goats in Hunt Area 18, both surveys suggesting a potential increase in abundance from the 1999 estimate of 171 ± 48 (Table 5). The population trend in GMUs 18 and 22 appears to be stable.

7.6.8 *Issues, Stressors, Concerns*

Mountain goats occupy a narrow habitat niche and that habitat is limited in the Plan Area; therefore, displacement of mountain goats from their habitat will have a magnified effect on the population. IDFG (Hickey, 2014. Pers Comm) has observed during elk survey flights increasing incursions of over-snow recreational traffic into mountain goat winter range in recent years. This has led to concerns that mountain goats, which are susceptible to human disturbance, may be displaced from preferred winter habitat, which is limited in the Plan

Area. Similarly, helicopters are known to cause disturbance, displacement, and even goat mortality (Cote' 1996; IDFG Draft Mountain Goat Management Plan 2006).

Timber harvest and related habitat impacts and disturbance have been identified as a concern by IDFG across mountain goat ranges (IDFG Draft Mountain Goat Management Plan 2006). Most mountain goat habitat on the Nez Perce-Clearwater National Forests is in proposed wilderness or is in low-value timber, however, and is not likely to be directly impacted by harvest unless access, harvest technology, or timber demand change.

Disturbance displacement from traditional trails and licks can affect mountain goat populations (IDFG Draft Mountain Goat Management Plan 2006). However, the location of trails and licks are not well known on the Forest. Where known or found, management impacts to licks and traditional goat trails should be avoided.

7.7 Mountain Lion

7.7.1 *Importance in the Planning Area*

Mountain lions (*Puma concolor)* are found throughout the Planning Area, although suitable and occupied habitat is patchy in some areas. Mountain lions are important as both a target species for hunters and as a predator that may influence populations of large ungulates, like elk and deer, which are also popular hunted species. Mountain lions are rarely seen in the wild, so they have little value to wildlife watchers; however, they are appreciated as a symbol of wild places and have cultural, scientific, and genetic values (IDFG Mountain Lion Management Plan 2002–2010).

Mountain lions occupy a wide range of habitats in Idaho and across the Plan Area. Lion habitat is defined by vegetative structure, topography, prey numbers, and prey vulnerability. The energetic needs of female lions with kittens limit viable populations to areas with sufficient numbers of deer and elk. Human activities have and will continue to affect the quantity and quality of mountain lion habitat by directly and indirectly altering the structure of vegetative communities and altering the number and distribution of prey animals. Thus, land use or habitat management practices that impact ungulate prey will also impact mountain lions. Road construction and improvement likewise increases mountain lion vulnerability by increasing access into previously remote or inaccessible ungulate winter ranges.

7.7.2 *Biology*

Mountain lion populations consist of resident adult males and females, transient males and females, and kittens of resident females. Home ranges are maintained by resident lions but not by transient lions. Home range size varies by sex and age of the lion, reproductive status, season of the year, and distribution and density of prey species. Resident lions maintain contiguous but fairly distinct home ranges in winter and summer. There is usually little overlap of resident male home ranges; however, each male home range may overlap more than one female home range. Home ranges of resident females overlap to varying degrees; usually female progeny will share some part of their maternal home range. Home range boundaries are maintained by mutual avoidance and marking by scrapes and scent marks. This form of home range maintenance serves as a mechanism to limit population density.

Female mountain lions become sexually mature and breed as early as 20 months of age, but first breeding may be delayed until age 5 depending upon social status and whether or not the female has established a home range. Kittens are produced every second or third year thereafter. Litter size varies from 1–6, but 2 and 3 kittens are most common. Young remain with their mothers for 17–22 months and may be self-sufficient at 10–15 months of age. Mountain lions may breed at any time of year in Idaho, although the peak of births is in spring. Thus, at any time of year, an adult female may have kittens or yearlings dependent upon her for food and survival. If an adult female is killed, chances of survival for her offspring are greatly reduced. Female mountain lions, especially those with kittens, tend to be easier to find and kill than males. A female must continually return to her kittens, and in so doing, leaves many tracks in a localized area. Adult females are also subject to more stress and risk of injury than males because they must hunt and kill large, potentially dangerous prey animals at more frequent intervals to successfully rear their kittens.

Mountain lion population density and age composition are primarily affected by exploitation rates. Mountain lion populations in remote areas usually have low exploitation rates, low population turnover, a greater proportion of resident lions, and an older age composition. Areas that are easily accessible have higher exploitation rates, high population turnover, a greater proportion of transient lions, and hence younger age composition. Research on exploited populations adjacent to stable, lightly hunted areas, indicates that mountain lion populations comprised primarily of young (4 years and younger) individuals may reach higher densities than populations with a large percentage of mountain lions in the 5-year and older age classes due to disruption of the self-spacing aspects of mountain lion social organization. Only uniform, heavy exploitation over the entire range will depress the number of mountain lions in these situations.

Mountain lions in North America have evolved to prey on moderate-sized mammals. In areas where a variety of prey types are available, deer and deer-sized prey appear to be the staple in lion diets. Larger prey such as adult elk and smaller prey such as a variety of rodent and bird species are also regularly taken. Ungulates are likely the staple diet for mountain lions in many areas, including the Plan Area, but the extent and effects of predation are not well understood. Lion predation on ungulate populations in Idaho likely varies with the species of prey, prey numbers and recent population trends, lion numbers, the types and abundance of other prey, and the types and abundance of other predators such as wolves, coyotes, black bears, man, and grizzly bears. Predation impacts also vary with habitat and land use characteristics, climate and weather, and hunting pressure, among other influences.

The impact of mountain lions on ungulates differs under varying circumstances. The type and strength of relationships between lion predation and ungulate populations have major implications to both lion and ungulate management. Identifying and understanding these relationships in areas with different complements of ungulates, predators, and habitats are important to managing mountain lions.

The future of mountain lions in Idaho depends upon the retention of sufficiently large habitat "reservoirs" that are managed for (i.e., have strict harvest regulations) or naturally contain low road densities and limited access. These areas provide resident mountain lion populations increased security and reduced vulnerability. Travel corridors connecting these and less remote areas must also be present to facilitate dispersal to provide a continual supply of young lions to repopulate adjacent habitats that are more easily accessed and heavily exploited. Any permanent reduction of wildlife habitat will result in reduced mountain lion populations; particularly losses of deer and elk winter ranges to industrial, residential, and recreational development.

In those portions of the state where mountain lion predation, depredations, or conflicts with humans are a concern, IDFG employs harvest as a tool to maintain mountain lion populations. IDFG permits liberal harvest and harvest techniques over much of the Plan Area in an effort to reduce mountain lion numbers and limit predation on deer and elk.

7.7.3 *Mountain Lion Population Status and Trends in the Plan Area, by Idaho Department of Fish and Game Management Unit*

No reasonable, reliable field survey methods are available to closely monitor mountain lion populations over a large landscape. IDFG has tracked mountain lion populations primarily through mandatory harvest reports since 1973. More recently, lion pelts tagging was required; premolar teeth have been removed for aging since 2001.

IDFG reports harvest for Mountain Lion Data Analysis Units (DAUs), which are generally comprised of one or more Game Management Units (GMUs). DAUs are based on similar habitat types, habitat security, accessibility, lion population density, prey species availability and, often, similarity to elk zone designations.

7.7.3.1 Palouse-Dworshak DAU

The Palouse-Dworshak DAU is comprised of GMUs 8A and 10A. Portions of both GMUs are within the Plan Area.

Three-quarters of Palouse-Dworshak DAU is comprised of timberlands owned by Potlatch Corporation, Idaho Department of Lands (IDL), and U.S. Forest Service (USFS). Timber harvest activity has created vast acreages of early successional habitat benefiting several ungulate prey species. The remaining one-fourth of the DAU is open or agricultural lands providing high-quality forage for deer and elk at certain times of the year. The area is bisected by canyons leading to the Palouse and Potlatch rivers (GMU 8A), Clearwater River, and lower North Fork of the Clearwater River (GMU 10A). Both GMUs share a common border along the lower end of Dworshak Reservoir. High open and closed road densities throughout the DAU provide good opportunities for hunting mountain lions.

Status and Trends

The Palouse-Dworshak DAU has a long harvest season, from 30 August–31 March. Harvest has been highly variable, probably due to varied hunting conditions between years.

Due to the increase in sightings and reports of encounters during the mid-1990s in this DAU, hunting seasons were liberalized. Harvest continued to increase and reached an all-time high during the 1997 season. It is likely that, due to the dense white-tailed deer populations throughout much of this DAU, the mountain lion population expanded its range into lower elevations and took advantage of the abundant whitetail population. This could potentially account for increased observations of mountain lions in lower-elevation whitetail habitat in this DAU during the mid-1990s. Despite a longer season, harvest has remained below the 1997 peak and currently has stabilized at about half that level.

Harvest increased dramatically from 1991–1997 in GMU 10A, where the highest annual harvest in the Clearwater region has occurred every year since 1994. Although lion harvest has declined from a peak in 1997, the GMU retains a relatively high harvest level. It is unclear whether the current status is a result of a population change or variable hunting conditions. However, hunters are indicating that lion observations are becoming less frequent.

Mountain lion harvest in the Palouse-Dworshak DAU averaged 30 lions for the 2009–2011 seasons; 34 lions were harvested in the 2011 season. This is above the 1990–1992 minimum harvest objective of 21. Subadults accounted for 44% of the harvest for the 2009–2011 seasons.

Issues and Concerns

None.

7.7.3.2 Lolo DAU

The Lolo DAU is comprised of GMUs 10 and 12. Units 10 and 12 are entirely within the Plan Area. Habitats include dense coniferous forest and mountains with relatively high precipitation.

Lion hunter access to the Lolo DAU is extremely limited during winter months, except along State Highway 12 from Lowell to Lolo Pass and by snowmobile along the North Fork of the Clearwater River. Much of both GMUs are difficult to access during hunting seasons because of snow, mud, and steep, rugged terrain. Deer and elk populations throughout most of the DAU provide a considerable prey base; however, elk numbers have declined drastically over the past 10 to 15 years.

Status and Trends

Harvest regulations are aimed at encouraging harvest and reducing lion predation on elk and deer within these GMUs. The current Lolo DAU mountain lion harvest season is relatively long, beginning at the end of August and extending through March. Bag limits and permitted techniques are also liberal, allowing harvest of 2 lions and the use of electronic calls for hunting lions in GMU 12.

The remote nature and difficult access in this DAU result in a moderate harvest level. An average harvest of 19 lions occurred for the 2009–2011 seasons. During the 2011 season, Lolo DAU hunters harvested 22 mountain lions, which is above the 1990–1992 minimum harvest objective of 20. Subadults accounted for 33% of the harvest for the 2009–2011 seasons.

Mountain lions appear to be declining in this DAU. This is probably a result of the effects of substantial decreases in elk numbers over the past few years and, to a lesser extent, additional lion hunting pressure from reduced nonresident tag costs and the 2-lion bag limit.

Issues and Concerns

None

7.7.3.3 Hells Canyon DAU

Hells Canyon DAU is comprised of IDFG GMUs 11, 13 and 18. Portions of Units 13 and 18 are within the Plan Area.

Habitat in Hells Canyon GMUs varies greatly across the DAU. Steep, dry river-canyon grasslands give way to higher-elevation forests that receive greater precipitation. Road density is moderate and access is limited in many areas. This DAU contains large tracts of both privately and publicly owned land. GMU 13 is primarily under private ownership and is managed mostly for agriculture and livestock production. GMU 18 is two-thirds public land, mostly in the Hells Canyon Wilderness and National Recreation Area. All three GMUs have borders along the Snake and Salmon rivers. Healthy mule deer and elk populations, as well as some white-tailed deer, provide a prey base for mountain lions.

Status and Trends

Hells Canyon DAU currently has a long mountain lion harvest season, from September through March.

Mountain lion harvest in Hells Canyon DAU has historically been moderate. For the 2009–2011 seasons, harvest averaged 20 lions per season. Seventeen mountain lions were harvested in the 2011 season. This level surpassed the IDFG 1990–1992 minimum harvest objective of 15 per year, but represents a decline from 2009 when 25 lions were harvested. Subadults accounted for 33% of the harvest for the 2009–2011 seasons.

Little change in lion harvest has occurred in this DAU since 1998. Harvest has remained low except when favorable weather conditions have provided increased lion harvest opportunities.

Issues and Concerns

None

7.7.3.4 Elk City DAU

Elk City DAU is comprised of IDFG GMUs 14, 15 and 16. Land ownership in Elk City DAU is approximately 80% public and 20% private. Privately owned portions are mostly at lower elevations along the Clearwater and Salmon rivers. Approximately 8% of the DAU falls within the Gospel Hump Wilderness.

Most of the DAU is characterized by productive coniferous forests with intermixed grasslands. Logging and mining have resulted in high road densities contributing to significant big game vulnerability during hunting season. Deer and elk populations throughout most of the DAU are thriving, providing a substantial prey base for lions.

Status and Trends

The mountain lion harvest season in the Elk City DAU is from 30 August through March. The northern portion of GMU 15 was closed to mountain lion harvest from 1999 through the 2003 season for research purposes, but has been reopened. To address predation on elk, additional hunting opportunity has been offered with a 2-lion bag limit in the portion of GMU 16 north of the Selway River since the 2000 season.

During the 2011 season, Elk City DAU hunters harvested 37 mountain lions compared to the 3-year average of 34; this is the ninth consecutive season in which harvest has been below the 1990–1992 minimum harvest objective of 40 lions. Subadults accounted for 33% of the harvest for the 2009–2011 seasons. Lion harvest peaked in 1996 and has been at a lower level since that time. Some of the initial decline may be attributed to the lion harvest closure in the northern portion of GMU 15 from 1999 through the 2003 season. Hunter access is difficult in some portions of this DAU.

A decline in total mountain lion harvest in Elk City DAU was to be expected after the northern portion of GMU 15 was closed in 1999. However, an additional drop in DAU harvest occurred in 2003. This may have been related to unfavorable weather conditions or the desire by hunters to pursue lions in areas known for greater lion densities. Harvest has remained relatively constant since 2001 but below IDFG's minimum 3-year harvest goal.

Issues and Concerns

None

7.7.3.5 Selway DAU

The Selway DAU is comprised of IDFG GMUs 16A, 17, 19 and 20. Large portions of the Selway DAU lie within Selway-Bitterroot, Frank Church-River of No Return, and Gospel Hump Wilderness areas, as well as large roadless areas that afford limited access.

Habitats within this DAU include dense, coniferous forests within rugged mountainous terrain, as well as Ponderosa-pine savanna habitat with open understory, and steep open bunchgrass hillsides and brush-fields along the Selway and Salmon River breaks. Although some white-tailed deer habitat occurs in these GMUs, the predominant ungulates are elk and mule deer.

Status and Trends

The Selway DAU harvest season currently runs from the end of August through March. A bag limit of 2 lions has been allowed since 2000. No female harvest quotas exist.

Mountain lion harvest in Selway DAU was higher in 2000 and 2001 (39 and 33, respectively) than during most years in the recent past. The higher harvest was likely a result of the increased bag limit and season length, increased nonresident hound permits, outfitter efforts, and low snow pack. However, harvest declined substantially in 2002 and has remained low since then. During the 2011 season, Selway DAU hunters harvested 23 mountain lions compared to the 3-year average of 19 lions, which is above the 1990–1992 minimum harvest objective of 16. Subadults accounted for 14% of the harvest for the 2009–2011 seasons.

The major obstacle to harvest in this DAU is difficult hunter access. Selway DAU occupies a vast, remote area with high-quality big game range. Consequently, effects of hunting on mountain lion populations in the DAU are generally considered to be light except in those few areas with good road access or in areas where outfitters concentrate their hunting efforts.

Because these are such large GMUs with ample prey base, the mountain lion population is likely much greater than harvest indicates. This suggests an under-harvested but evidently self-regulating population.

Issues and Concerns

None

7.8 MULE DEER

7.8.1 *Importance in the Planning Area*

Mule deer are a true icon of the West, providing recreational, aesthetic, social, cultural, and scientific values for Idaho citizens. Mule deer hunting is a primary activity for nearly 150,000 hunters and is a key species maintaining the rich hunting heritage in Idaho.

Mule deer are economically important to the Idaho Department of Fish and Game (IDFG) and to many small rural economies in Idaho. Cooper and Unsworth (2000) estimated mule deer hunting resulted in direct expenditure of $42 million in trip-related expenses, not including equipment purchases. Many of these expenditures were for fuel, meals, and lodging in rural towns. Using a typical economic multiplier of 2.5 (Gordon and Mulkey 1978), the total estimated economic impact of mule deer hunting in Idaho exceeded $100 million. Additionally, more than 1,000 jobs in Idaho are directly supported by mule deer hunting-related expenditures (Cooper and Unsworth 2000). In 2006, direct revenues to IDFG from mule deer license and tag sales were nearly $6.3 million, representing nearly 20% of total license/tag revenues used by IDFG to implement important wildlife conservation programs including enforcement, population monitoring and research, and habitat conservation (IDFG).

The Plan Area is on the northern edge of good mule deer habitat; and mule deer are distributed throughout suitable habitat across that Planning Area. The largest mule deer populations within the Plan Area are in the Salmon River breaks and the “island” area northwest of Riggins.

IDFG tracks mule deer populations in Population Monitoring Units (PMUs), each of which contain a number of Game Management Units (GMUs). Aerial surveys are largely ineffective in some portions of the Plan Area due to habitat and terrain. The status of mule deer populations in those portions of the Plan Area is monitored by a combination of aerial surveys, where effective, and mandatory hunter harvest reports.

Mule deer populations in the overall Plan Area are generally stable compared to those in other parts of the state, which exhibit a wide range of variability. Mule deer populations across the region, including in the Plan Area, appear to be increasing, partly in response to very conservative harvest management (Koehler, IDFG, pers. Comm. 2013).

7.8.2 *PMU 1, Lower Salmon*

Mule deer PMU 1 (Lower Salmon) is comprised of GMUs 11, 11A, 13, 14, and 18. Portions of GMUs 13, 14, and 18 are in the Plan Area; 11 and 11A are off-forest but influence mule deer populations in adjacent units.

This PMU contains large tracts of both privately and publicly owned lands. Most of GMU 13 has been under private ownership since settlement and is managed for agriculture and livestock. Historically, sheepherders ran their flocks in the canyons of GMUs 14 and 18, and logging occurred in the forested areas of these GMUs. GMUs 14 and 18 are two-thirds public lands with the remaining private land located primarily at lower elevations along the Salmon River. The majority of Forest Service Hells Canyon Wilderness Area, designated in 1975, is in GMU 18.

Mule deer populations in PMU 1 were historically low. Accounts from Lewis and Clark during the 1800s suggested that very few animals were found throughout Clearwater River country. Populations probably did not change much until the large fires of the early 1900s that converted vast expanses of unbroken forest into a mosaic of successional vegetation types, and large numbers of domestic livestock altered grass-dominated habitats into shrub cover. Mule deer populations in PMU 1 probably peaked during the 1930s–1960s as a result of new, high-quality habitat and lack of competition by other ungulates. As elk and white-tailed deer populations increased and habitat changes including succession, development, and loss of key winter ranges occurred, mule deer populations likely decreased. Information derived from estimates made by IDFG wildlife managers suggests mule deer numbers in PMU 1 declined from around 23,000 in 1960 to about 15,000 in 1990.

Habitat productivity varies widely throughout the PMU with steep river-canyon grasslands having low annual precipitation, to higher elevation forests having good habitat productivity and greater precipitation. Late successional forest cover types have become fragmented within the area. Various weeds and non-native grasses such as yellow star thistle and cheatgrass have disturbed expansive acreages of grassland cover types in this PMU. Road density is moderate and access is restricted in many areas, resulting in medium to low vulnerability of big game to hunters, especially within the Snake River and Salmon River canyons below White Bird.

Historically, sheep and cattle ranchers homesteaded the canyon lands in this PMU, while farmers settled prairie land. As settlement increased, the forested portions of the area were intensively logged, especially on private land. The forests were frequently high-graded, and existing forests still show the scars. In addition, intensive-grazing practices degraded many meadow areas and canyons, allowing the invasion of noxious weed species, especially in drier areas.

7.8.2.1 Status and Trends:

Harvest and aerial survey data for PMU 1 are limited. The initiation of controlled hunts in GMUs 11A, 13, 14, and 18 in 1998 resulted in improved harvest information. GMUs 11 and 14 are the only units within this PMU having winter range surveys since 1994. An aerial survey of the White Bird trend area was conducted during the winters of 2000–2005; this survey has since been discontinued. Mule deer surveys currently employ a protocol that surveys a select sample of GMUs each year when possible, and a complete population survey approximately every 5 years. IDFG budgetary constraints and resultant re-prioritization have stalled the implementation of the recently adopted aerial survey schedule in PMU 1 to date.

During 2007, wildfires in GMUs 13 and 18 also burned large tracts of wildlife habitat, primarily on public lands. The effect of this has not been analyzed, but IDFG expects it will be years before the shrub component fully recovers and decades before conifer regeneration provides thermal and hiding cover. Accelerated noxious weed invasion is a concern in burned areas.

Poor productivity and declining mature buck numbers, a decrease in total numbers, and a 50% decrease in harvest from the late 1980s to the mid-1990s caused concern for mule deer herds in these GMUs. Aerial surveys in 1992 in GMUs 14 and 18 indicated buck:doe ratios at 7:100 and 13:100, respectively. Concerns led IDFG to implement antlered-only controlled hunts beginning in 1998 in GMUs 11, 11A, 13, 14, and 18.

A December 1999 aerial survey in GMU 14 resulted in an estimate of 2,622 mule deer with a buck:doe:fawn ratio of 18:100:50. GMU 14 was surveyed again in December 2004, producing an estimate of 2,814 total mule deer with a buck:doe:fawn ratio of 34:100:61.

The composition/trend survey conducted in December 1999 indicated a total population of 1,725 mule deer in the White Bird trend area. This represented a 26% decrease in total numbers from the same sub-GMUs flown during the early 1990s. Subsequent White Bird trend area surveys conducted during the winters of 2001–2002 and 2002–2003 indicated a stable population with increasing buck:doe (22:100 average) and fawn:doe (53:100 average) ratios. A survey conducted in 2003–2004 found similar buck:doe (23:100) and fawn:doe (47:100) ratios, affirming a stable population. However, the total population estimate increased by 54% over the 2002–2003 count, to 2,654 mule deer. It is likely that this increase can be attributed primarily to a change in deer distribution into the survey unit due to a significant snowfall event just prior to the survey rather than a true increase in the deer population. The 2005 survey yielded results similar to pre-2004 levels, with a total population estimate of 1,937 and a buck:doe:fawn ratio of 20:100:63.

Overall, based on surveys and harvest reports, mule deer populations in PMU 1 appear to be increasing.

7.8.2.2 Issues

During the winter of 2009, a species of exotic louse, *Bovicola tibialis*, was documented for the first time in Idaho. The louse was found on a dead mule deer fawn in the city of Riggins. Four deer sampled in Riggins later that spring were found to have *Bovicola tibialis;* all 4 deer had extensive, self-inflicted hair loss associated with the lice infestation. In early March of 2012, IDFG and Wildlife Services removed 60 deer in an effort to stop the spread of the louse. More than 90% of the deer were infested with *Bovicola tibialis*. Efforts were then made to treat the remaining deer within city limits. In surveys during May of 2012, *Bovicola tibialis* was found at lower densities in mule deer from other Idaho locations at Salmon, Elk Bend, Emmett, and the Andrus Wildlife Management Area (Council), indicating that the louse was not confined to Riggins. Monitoring for the presence of this louse is ongoing.

A decline in cattle grazing and successive years of drought during the late 1980s and early 1990s may have contributed to rangeland shifting from forbs to grasses, while intensive logging has created extensive brushy areas on winter ranges. These shifts in vegetation resulted in increases in white-tailed deer and elk populations, creating competition with mule deer on both winter and summer ranges.

Available mule deer winter range is being encroached upon by construction of summer homes and resorts along the Snake and Salmon rivers. Invasive weeds that out-compete desirable native mule deer forage species are a major concern in some parts of PMU1.

Currently, there are few depredation concerns involving mule deer in PMU 1.

7.8.3 *PMU 15, North Idaho*

Mule deer PMU 15 (North Idaho) consists of GMUs 8, 8A, 10, 10A, 12, 15, 16, 16A, 17, 19, and 20. These GMUs have widely divergent demographic and habitat characteristics, but are grouped because they support only low numbers of mule deer in isolated pockets of suitable habitat. These Units are managed by IDFG primarily for white-tailed deer or are located in wilderness areas where most mule deer hunting is largely incidental in nature.

GMUs 10, 10A, 12, 15, and 16 are predominately timberlands, with the majority of ownership being private timber companies, state timber lands, or USFS. In 1964, most of the southern portion of GMU 12 was designated as part of the Selway-Bitterroot Wilderness. Most private ownership is at lower elevations along the breaks of the Clearwater River.

Timber harvest began in GMU 10A during the early 1900s and increased dramatically in the 1970s. In 1971, Dworshak Reservoir flooded approximately 45 miles of North Fork Clearwater River in GMU 10A and permanently removed thousands of acres of prime low-elevation big game winter range. Units 8 and 8A are mixed private and public lands, a high percentage of which is in commercial timber and agricultural use.

IDFG relies on a combination of aerial surveys and mandatory harvest reports to assess mule deer populations. Mule deer comprise less than 10% of the deer harvested in these Units within the Plan Area. Aerial surveys are not practical in most of these GMUs because mule deer are scarce and hiding cover is abundant. Aerial surveys are not conducted in some GMUs (16A, 17, 19, and 20) because of their remote wilderness setting and relatively little emphasis on the targeting of mule deer by hunters.

USFS records (citation) and the memories of long-term residents indicate that big game, including mule deer, were relatively scarce in the early 1900s. Large-scale fires between 1910 and 1931 created large brush-fields favored by mule deer. This newly created habitat, in combination with a major predator reduction program beginning in the early 1920s, allowed the sustained growth of mule deer, white-tailed deer, and elk populations. Despite a series of severe winters, mule deer populations continued to increase. By the mid-1950s, they were estimated to outnumber white-tailed deer in the central part of the PMU.

Concern about over-browsed winter ranges and an overabundance of both white-tailed and mule deer throughout the state, in general, led to aggressive management to reduce the deer population. By the early 1970s, this goal was accomplished and shorter hunting seasons were authorized.

Until the 1930s, wildfire was the primary habitat disturbance mechanism in GMUs 10, 12, and 16. Between 1900 and 1934, approximately 70% of the Lochsa River drainage was burned by wildfires. In addition, from the 1920s to 1990, thousands of miles of roads were built for timber harvest in GMUs 10, 10A, 12, 15, and 16.

GMUs 16A, 17, 19, and 20 represent much of Idaho’s backcountry; a large portion of this area is designated wilderness. Because of the rugged, remote terrain and difficult access, management control of deer herds in these units is difficult at best. Weather, fire, and plant succession have ultimately played a much larger role in deer populations than efforts of wildlife managers. A mid-September to late November season has been standard in the backcountry GMUs since the 1950s. Much of the deer harvest is localized around access points such as roads and airstrips and most of the harvest is incidental to elk hunting.

7.8.3.1 Status and Trends

IDFG relies almost entirely on mandatory harvest reports to assess mule deer populations in this PMU. Mule deer are in isolated pockets of the Plan Area and hunter effort is very low. Based on the limited harvest data available, mule deer populations in this PMU are considered stable (Koehler, IDFG. Pers. com. 2014)

7.8.3.2 Issues

A large percentage of the land in PMU 15 is administered by USFS, with private lands mostly restricted to the valley bottoms. Recreation and timber management are the dominant human uses of the landscape. PMU 15 is a generally moist region with nearly continuous canopy coverage. Mule deer mix with white-tailed deer during winter, although there is a tendency for mule deer to winter at slightly higher elevations. Mule deer depredations are nonexistent.

Much of the mule deer habitat in this area is the result of large fires during the early 1900s, with some additional habitat created when large areas were block clear-cut during the 1960s. Currently, both fire and harvest are having little effect on the landscape and mule deer habitat can be expected to decline in quantity and quality as succession progresses, turning brush-fields back into timber.

Little is known about the ecology of mule deer in the heavily forested environments typical of much of this PMU. The timbered nature of the landscape, combined with the relative scarcity of mule deer, does not allow aerial surveys to be used to monitor mule deer populations in this area. However, the influence of hunting on mule deer population dynamics is believed to be minor, based on the minor influence of hunting measured on white-tailed deer populations in the same areas. The high percentage of ≥4-point bucks in the antlered harvest (~50%) is consistent with this hypothesis.

White-tailed deer, mule deer, and elk have sympatric ranges throughout the year in PMU 15. Mountain goat and moose distribution overlaps that of mule deer in some areas as well. The effects of inter-specific competition are unknown but are felt to be of minor consequence at existing population levels.

Predation can be an important factor in the population dynamics of mule deer in this PMU. Radio-telemetry studies conducted in the Priest River Basin during the late 1980s and early 1990s indicated predation was an important influence on white-tailed deer populations. Mountain lions, black bears, bobcats, coyotes, and wolves are present in PMU 15, and all prey on mule deer. A substantial increase in the mountain lion population was detected in the mid-1990s, leading to increased public concern over the impacts of predation on future mule deer populations. High participation in mountain lion hunting led to record harvests during this period but has since declined. Current mountain lion numbers are assumed to be significantly lower than those found 10–15 years ago. Wolves were reintroduced by USFWS in central Idaho in the mid 1990s and have become well established in portions of this PMU. The addition of wolves will likely have an impact on black bear, mountain lion, and coyote populations. At some level, predation could benefit deer herds to the extent that it reduces elk competition and keeps deer herds below carrying capacity where they can be more productive. However, excessive levels of predation can also suppress prey populations to undesirably low levels. At this point, it is unclear what the net impact of predation will be on mule deer with the addition of wolves in PMU 15.

7.9 WHITE-TAILED DEER

7.9.1 *Importance in the Planning Area:*

White-tail deer are one of the most sought after big game animals in the Clearwater region and in the state. Whitetails are abundant north of the Salmon River. The highest densities of white-tailed deer in the state are thought to occur in the lower Clearwater and Salmon River drainages. Harvest records from the Idaho Department of Fish and Game (IDFG) confirm this: from 1994 through 2003, Clearwater region white-tailed deer have averaged 43% of the total statewide deer harvest (WTD MP); that percentage is likely to be much higher in the Planning Area due to the high number of whitetails compared to mule deer.

White-tailed deer hunting is economically important in Idaho. Deer hunting, including both white-tailed and mule deer hunting, provided 840,000 hunter days and generated $109 million in retail sales in 2001 (IAFWA 2002). Approximately 2,000 jobs were tied directly to deer hunting in 2001 and resulted in $1.3 million in State income tax. Approximately 42% of the state’s deer hunter use days were expended in units where the majority of deer harvest was white-tailed deer (IDFG unpublished data); several of those units are within the Plan Area.

Forest Service lands in the Plan Area that are popular for deer hunting comprise substantial portions of Clearwater, Latah, and Idaho Counties. Based on Cooper et al. (2002) the combined economic impact of deer hunting in those three counties alone was in excess of $31 million in 2007 (IDFG 2007).

7.9.2 *Biology*

The subspecies of white-tailed deer found in Idaho is *Odocoileus virginianus ochrourus*, the northwest white-tailed deer.

7.9.3 *Habitat*

Winter habitat use of white-tailed deer in Idaho has been described in several studies (Pengelly 1961, Owens 1981, Pauley 1990, Secord 1994). White-tailed deer are very adaptable and some differences in habitat use patterns occurred among these studies. However, synthesis of information from these studies reveals general habitat use patterns that help confirm and extend existing white-tailed deer habitat management guidelines (Jageman 1984). Weather has a strong influence on winter habitat use patterns of white-tailed deer. Mild open winters reduce environmental stress on deer; and habitat use may be more variable under these conditions. In the most severe winters, availability of key winter range habitat elements becomes critical to white-tailed deer survival.

Habitat selection can generally be related to maintenance of the animal’s energy budget (Armleder et al. 1986). All deer at northern latitudes experience winter conditions in which energy losses from movement, cold temperatures, and wind chill exceed energy gains from food intake. When winter range quality is high or winter conditions are mild, energy losses only moderately exceed gains and most deer survive the winter. However, when winter ranges are in poor condition or winter conditions are severe, energy losses greatly exceed energy gains and can lead to starvation, increased vulnerability to predation, and substantial losses in deer population. Deer use both topographic and vegetative habitat features to minimize energy losses and maximize energy gains during winter by selecting areas with shallow snow, adequate food, and sufficient shelter.

White-tailed deer movement from summer to winter habitat may involve actual migration from geographically distinct seasonal home ranges or shifts in use patterns within overlapping seasonal home ranges (Pauley 1990, Secord 1994). Snow is the most influential environmental factor during winter and has a significant effect on the energy cost of locomotion. Energy cost of locomotion increases exponentially with increasing snow depth (Mattfeld 1974, Parker et al. 1984). Compared to snow-free conditions, snow accumulations of as little as 5 cm (2 in) can increase energy expenditures by 10%. When snow accumulation reaches 50 cm (20 in) energy cost of locomotion may increase to 5 times that of snow-free condition expenditures.

In winter, deer move to lower elevations, usually less than 3,000 feet. Low elevation areas generally experience less snow accumulation and milder temperatures than high elevation areas and thus help deer minimize thermoregulation and movement energy costs. Deer select southeast to southwest or west aspects in winter. These aspects receive greater solar exposure than other aspects. This allows deer to minimize energy expenditures from heat loss. Increased sunshine and associated warmer temperatures also lead to shallower snow depths, consequently reducing energy expenditures for both locomotion and thermoregulation. Further, snow depths are less on slopes than they are on level areas because the same amount of snow is distributed over a larger area on slopes relative to flat areas. When slopes become too steep, energy gains from reduced snow depths are offset by the increase in energy expenditures used to climb slopes; therefore, deer generally select slopes with grades <50% during winter (Parker et al. 1984, Pauley 1990).

Vegetative characteristics of habitat provide deer two broad categories of resources: forage and shelter. Site conditions on southerly aspects with moderate slopes as described above often result in forest stands that are more open than other sites. More sunlight reaches the forest floor in open sites, resulting in increased development of forage in the shrub layer. Conversely, these open stands have lower snow interception properties than dense stands on more level or more northerly aspects. During mid-winter when snow cover is deepest, deer often move to dense mature coniferous forest stands with canopy closure >70% even though the shrub layer is depauperate and forage availability is low on these sites (Peek 1984, Pauley 1990, Secord 1994). Pauley (1990) found white-tailed deer making extensive use of these areas in both early and late winter.

In winter, whitetails subsist almost entirely on browse. White-tailed deer will consume a wide variety of deciduous browse species but some of the more important browse species include red osier dogwood (*Cornus stolonifera*), redstem ceanothus (*Ceanothus sanguineus*), serviceberry (*Amelanchier alnifolia*), maple (*Acer glabrum*), pachistima (*Pachistima myrsinites*), willow (*Salix spp.*), and chokecherry (*Prunus virginiana*) (Pengelly 1961). As winter progresses deer also make increasing use of coniferous browse, principally Douglas-fir (*Pseudotsuga menziesii*) and western redcedar (*Thuja plicata*) (Jageman 1984).

White-tailed deer winter habitat selection that optimizes security and thermal cover at the expense of forage availability is well documented (Ozaga 1968, Wetzel et al. 1975, Moen 1976, Boer 1978, Owens 1981). Microclimate studies of closed canopy coniferous stands have demonstrated that these stands have the narrowest thermal ranges, least wind flow, less radiant and convective heat loss, and most favorable snow conditions (Verme 1965; Ozaga 1968; Moen 1968, 1976). Availability of such closed forest stands within white-tailed deer winter ranges is an important winter habitat feature. Ideal winter range will be characterized by a high degree of horizontal diversity with both shrub and open forest habitats—with high forage densities in close proximity to dense, closed forest stands with superior shelter qualities (IDFG White Tail Deer P Management Plan, 2005 -2014). This habitat structure allows deer to minimize energy expenditures when moving between these areas to meet habitat resource needs in the face of changing winter snow and weather conditions.

In contrast to winter habitat use, summer habitat use by white-tailed deer has not been as well studied (Pauley 1990). White-tailed deer are highly adaptable and, in the absence of the stress of deep snow and cold temperature, they can successfully exploit a wide variety of habitat conditions including forest, shrub, agricultural, riparian, and suburban settings. Because of this adaptability, characterizing habitat use during summer is more difficult. However, habitat selection can again be related to the annual energy budget of white-tailed deer and some generalizations are possible. Whereas deer energy losses exceed energy gains through winter, summer energy gains must exceed energy losses so that deer can recover lost condition and replenish energy reserves for the upcoming winter. Although we typically think of winter range quality as the critical population “bottleneck” because this is when we observe mortality, some research has suggested adequate accumulation of energy reserves during summer is at least as critical to winter survival because the condition of deer entering winter strongly influences their ability to survive (Ozoga and Verme 1970). Summer range quality has also been linked to productivity, recruitment, and growth rate in deer (Cheatum and Morton 1946, Cheatum and Severinghaus 1950, Julander et al. 1961, and Verme 1963). Winter habitat selection emphasizes minimizing energy losses whereas summer habitat selection emphasizes maximizing energy gains. At winter’s end deer energy reserves are at their annual low point and fetal development in the final trimester is placing high nutritional demands on does (Verme 1969, Moen 1973). Consequently, deer select spring/summer/fall habitats with the most nutritious forages available. Open canopy, low elevation, southerly exposed habitats are the first to be snow free and support new nutritious green forage in the spring; and whitetails demonstrate a decided shift from forested to open habitats in the spring (Garrott et al. 1987, Pauley 1990, Secord 1994).

White-tailed deer use of grass, forbs, and agricultural crop forages is higher in spring and early summer than at any other time of year (Peek 1984). Low-elevation burned areas, riparian habitats, clear-cuts, warm well-drained slopes with minimal canopy closure, and agricultural areas can all fulfill this habitat requirement. Deer often select forest ecotones adjacent to foraging areas and may limit their use to edges of these openings while avoiding interiors of large openings (Gladfelter 1966, Telfer 1974, Keay and Peek 1980). Several studies have suggested forest cutting units and prescribed burns should be restricted to not more than 20 acres in size to provide maximum benefits to white-tailed deer (Peek 1984).

As summer progresses deer initially follow spring green-up to higher elevations, make extensive use of clear-cuts, burns, and open forest areas, but eventually shift to more mesic northerly aspects and forested habitats in late summer and fall. White-tailed deer use of older timber stands and mesic sites, and reduced use of clear-cuts and open areas in late summer and fall is related to plant phenology. Dry, hot weather during July and August dries deciduous species in open areas. Freezing temperatures in October and November further diminish forage in open habitats whereas dense forest canopies maintain moist conditions and moderate temperatures resulting in greater availability of nutritious forage in these habitats (Pauley 1990). This late summer/fall shift to northerly aspects and mesic sites has been described in several studies (Shaw 1962, Owens 1981, Pauley 1990). The shift to denser forest stands may also be related to hot weather.

Canopy cover reflects solar radiation and provides cooler, more comfortable temperatures than open areas in summer (Moen 1968, 1976). However, white-tailed deer are also frequently observed bedding in open areas during summer (Pauley 1990).

7.9.3.1 Security Habitat

Habitat used by deer to avoid detection and minimize disturbance by man, his machines,

or by other animals is called hiding or security cover. Adequate security cover protects deer from energy expenditures by reducing both the need to flee and distance to flee disturbance or threat. Security habitat may also prevent direct mortality from predation or hunting by allowing deer to avoid detection. Security is typically provided by screening vegetation, screening topography, and distance from potential sources of disturbance. Hiding cover is considered to be vegetation capable of hiding 90% of a standing adult deer from a human at a distance of 200 feet during all seasons in which deer normally use the area (Jageman 1984). During fall hunting seasons, deer may use the heaviest cover available to avoid detection (Sparrowe and Springer 1970).

In contrast to elk, the effects of secondary roads or trails on white-tailed deer are not well documented. Because of their more secretive nature and smaller home ranges, white-tailed deer may be less subject to functional loss of habitat due to behavioral displacement than elk (Lyon 1979), especially where cover is dense. In contrast, road density, which is known to increase elk vulnerability to hunting season mortality (Leptich and Zager 1991, Unsworth et al. 1993, Hayes et al. 2002), likely increases white-tailed deer vulnerability to hunting season mortality. This increase is because greater road density enhances hunter distribution and deer-hunter encounter rates while eliminating refugia. Additional research is needed to illuminate importance of secondary roads on deer habitat use and survival (IDFG).

7.9.4 *Population Dynamics*

The peak of breeding of whitetails in Idaho is middle to late November, with fawns born from late May through late June. Pregnancy and fetal rates of adult does are similar to those found elsewhere, but fawn pregnancy rates in Idaho are low. Generally, reproductive rates for white-tailed deer in Idaho are not dramatically different from those of mule deer.

The survival of fawns one year is a primary influence on white-tailed deer population size the following year. Survival of fawns in Idaho is influenced heavily by energetic demands from the prior winter on the doe, by summer nutrition, by predation, and by energetic demands of their first winter. Late summer composition surveys averaged 58 fawns per 100 does during September 2001–2004.

By comparison, fall fawn ratios in Midwestern states often exceed 100 fawns per 100 does.

In contrast to populations over much of the United States, natural causes, not hunting, are the primary sources of mortality of white-tailed deer in Idaho. Even with long hunting seasons in

Idaho, the annual survival of bucks is relatively high, allowing substantial numbers to reach older age classes and producing high buck:doe ratios.

Deep winter snows are a major influence on population dynamics of white-tailed deer in the northernmost portion of their distribution, including most of Idaho. During the severe 1996–1997 winter, Sime (pers. comm. 1997. Cited in IDFG Whitetail Management Plan) estimated 70% of the white-tailed deer died on her study area in northwestern Montana, including over 90% of fawns. In northern Idaho, natural mortality, including both predation and winterkill, averaged 10% annually for does, and 23% for bucks from 1986 through 1995 (IDFG unpubl. data).

Predation is an important influence on population dynamics of white-tailed deer in Idaho. The most common predators on white-tailed deer include coyotes, bobcats, black bears, mountain lions, and domestic dogs. These predators also prey upon other ungulates such as mule deer, elk, antelope, bighorn sheep, and mountain goats, as well as rabbits, hares, mice, etc.

Coyotes are the most abundant predator on deer in Idaho. In most areas, coyotes feed on a wide variety of items; however, deer are also a part of their diet, particularly during spring fawning and winter. Coyotes have been noted to be efficient predators of neonate fawns where habitat is poor. During winter, coyotes may take a number of fawns due to snow conditions and poor animal condition. Studies have shown that coyotes can cause up to 80% of fawn mortality. Because fawns die of many causes, coyote predation on fawns could be largely compensatory. Most fawns taken by coyotes in winter are in very poor physical condition and likely to die of malnutrition.

Mountain lions are likely the second most abundant predator of deer in Idaho; their primary prey are deer, elk, and smaller mammals like rabbits. Mountain lions feed on deer year round, being most efficient during winter months in deep snow conditions. Mountain lion predation on white-tailed deer changes continuously, affected by weather and changing deer population numbers, but is an important influence on white-tailed deer numbers statewide.

Little is known about black bear predation on white-tailed deer in Idaho; however, black bears have been shown to be significant predators of elk calves in spring. Predation on deer by black bears is probably highest during a fawn’s first 4 weeks, during late spring/early summer. Bears are the most effective predators when habitat is patchy and insufficient to hide fawns.

Wolves are present, but not abundant in some white-tailed deer range in Idaho (e.g., Units 8, 8A, and 14), but are abundant in other portions of the Forest. Elk are the primary prey of wolves in Idaho; but, as evidenced by the reliance of wolves on white-tailed deer in the Midwest and western Montana, wolves can subsist primarily on white-tailed deer. Currently, the impact of wolves on white-tailed deer in Idaho is likely negligible; however, their impact on white-tailed deer and other ungulate populations will increase as wolf populations expand.

White-tailed deer populations in Idaho cannot be expected to exhibit the same high growth rates observed elsewhere in their range, where predation is a minor influence. Although general predator-prey relationships are evident, no single predator species can be expected to track white-tailed deer populations closely. The influence of predation on white-tailed deer is complex, including effects of one predator species on other predators, effects from the presence of alternate prey species, and effects of changing ungulate populations on forage. It is this entire mix that determines the degree to which predators limit white-tailed deer.

Whitetails have a relatively high intrinsic rate of increase. When deer populations are at, or near, carrying capacity, predation is most likely compensatory and reducing predation will not increase deer numbers. In this case another agent such as winter mortality or disease will replace predation mortality if predation is reduced. When deer populations are below carrying

capacity predator mortality is more likely to be additive. It is often difficult to predict or even know what the current carrying capacity of a deer range is due to ever-changing habitat factors.

7.9.5 *Disease*

Disease and parasite issues in white-tailed deer can be very complex. In general, white-tailed deer are the most studied free-roaming ruminant in the United States. Extensive disease investigations and documentation have been done in most parts of the country where white-tailed deer reside. Historically, IDFG has not actively conducted targeted surveillance for disease or parasites in white-tailed deer; information about disease in Idaho is therefore limited and obtained opportunistically.

At this time, the primary disease of concern in white-tailed deer in Idaho is epizootic hemorrhagic disease (EHD). EHD is present at a low level within some white-tailed deer populations in Idaho. Serological data from mule deer and elk indicated EHD exposure in 10–20% of animals tested. White-tailed deer, as a primary host of the virus, are likely exposed at a higher rate. Several small and one large outbreak of EHD have been documented in white-tailed deer in the IDFG Clearwater Region of Idaho, which includes portions of the Forest. The most recent and largest outbreak (5,000–10,000 deer died) occurred in late summer and fall of 2003. This outbreak centered in the Kamiah area, but occurred in deer ranging from Kendrick south to Riggins and from Lapwai east to Clearwater. There have been scattered reports of EHD in the Clearwater Region since then, but no major outbreaks have been reported.

Chronic wasting disease (CWD), although not identified in Idaho, may pose problems in the future and warrants continued surveillance. A small number of samples from Idaho were evaluated for bluetongue virus with positive results (MacLachlan et al. 1992). Foreyt and Compton (1991) found no evidence of meningeal worm (*Parelaphostrongylus tenuis*, also known as “brainworm”) in northern Idaho, but a large-scale survey for this parasite is warranted to better define the current status of this parasite in the state. Other disease or parasite issues may be present or of concern and should be addressed when they become apparent or problematic (IDFG 2005, White-tail Deer Management Plan 2005–2014.).

7.9.6 *Niche Overlap with Other Ungulates*

White-tailed deer are sympatric in various parts of the state with elk, moose, mule deer, bighorn sheep, mountain goat, pronghorn, and domestic livestock. The degree of competitive influences among these species is unknown; but it is likely that either direct competition for resources, or indirect exclusionary processes, occur under some circumstances. Baty (1995) observed spatial separation between white-tailed deer and elk on winter range in northwestern Montana. White-tailed deer used small herd home ranges with abundant overstory canopy, whereas elk used large areas with sparse overhead canopy. Baty also found little overlap in food habits, with elk selecting largely for grasses, and deer selecting for browse. Food habits were similar between white-tailed and mule deer, but there was also a significant difference in preferred habitat, with mule deer occupying drier and more open sites than did whitetails. In Idaho, sites preferred by mule deer are often at higher elevations than those preferred by whitetails during all seasons.

Moose and white-tailed deer distribution overlap substantially in North America. In western United States and Canada, enough niche separation exists so neither species detrimentally affects populations of the other to any large degree. Moose appear to select habitat largely on the basis of forage quality and abundance, while cover is more of a primary factor for whitetails. In eastern United States and Canada, white-tailed deer tend to replace moose not due to competition, but due to the effects of meningeal worm. Wild sheep and goats select strongly for steep, rocky, open terrain not preferred by whitetails.

Livestock and white-tailed deer use sympatric ranges in many portions of Idaho. Domestic grazing, depending upon the situation, can either enhance or degrade white-tailed deer habitat (Matschke et al.1984). Extensive grazing of riparian areas generally reduces available habitat for white-tailed deer (Dusek et al. 1989).

7.9.7 *Population Management*

White-tailed deer populations are dependent on habitat quality and quantity. Simply stated, when high-quality habitat is abundant, reproductive rates are high, survival is high, and deer numbers will increase. As the number of deer increases, less forage is available for each individual, until eventually, reproduction slows, and survival decreases, and the herd decreases. After the population declines, there is again adequate nutrition for remaining animals, and reproduction and survival increase once again. IDFG manages hunting of whitetails to keep deer numbers sufficiently low such that reproduction and survival is high, resulting in a more stable population and a harvestable surplus of deer each year (IDFG WTP).

The forage competition model above provides a useful overall framework for a general understanding of how ungulates interact with the vegetative component of their environment. However, other factors, both density-independent and density-dependent, may influence a population more than forage competition. The two most prominent factors affecting white-tailed deer in Idaho are winter weather and predation. Various populations of white-tailed deer are regulated by different combinations of factors. A single population may be regulated primarily by forage availability one year, a combination of forage availability and winter severity the next year, and forage and predation the third. The key to managing white-tailed deer populations is in understanding the importance of these influences, our ability to modify these influences, and our ability to adapt to those influences (IDFG WMP).

7.9.8 *Status and Trends*

Unregulated harvest by miners, loggers, and other settlers during the late 1800s and early 1900s apparently resulted in very low numbers of ungulates in Idaho, including white-tailed deer. Conservative hunting seasons and high-quality habitat produced by large fires and heavy logging in the first third of the 20th century resulted in increased white-tailed deer populations (Pengelly 1961). Deer populations continued to increase until the late 1940s, when 2 consecutive severe winters reduced deer numbers throughout the state. Conservative seasons, high-quality habitat, and a pronounced predator control program combined to allow deer herds to recover quickly. White-tailed deer numbers appear to have reached a peak in the 1960s, when game managers became concerned about over-browsing of winter ranges and established long hunting seasons in order to reduce deer numbers and improve winter range quality.

White-tailed deer populations declined during the 1970s, likely as a consequence of heavy harvest and declining quality of aging stands of habitat. Populations increased again during the 1980s and early 1990s in north central and northern Idaho. The 1996–1997 winter was one of the most severe on record and white-tailed deer in portions of the Plan Area declined substantially. White-tailed deer populations have apparently increased moderately since the 1996–1997 winter. Roughly 200,000 white-tailed deer currently exist in Idaho, and populations may be approaching levels of the 1950s and 1960s in some areas.

7.9.9 *White-tail Deer Population Status and Trends based on Idaho Department of Fish and Game Data Analysis Units*

IDFG's best tool for tracking population trends in whitetails is mandatory harvest reports filed by hunters. White-tailed deer harvest is tracked and reported by Data Analysis Units (DAUs), which are geographic areas selected on the basis of variation in population dynamics, agricultural considerations, habitat type and condition, hunter characteristics, and social attitudes. Each DAU is made up of one or more Game Management Units (GMUs).

7.9.9.1 DAU 2

DAU 2 is comprised of GMUs 7, 9, 10, 12, 14, 15, 16, 18, 23, and 24. Of those Units, all or portions of DAU 10, 12, 14, 15, and 16 are in the Plan Area.

The majority of DAU 2 consists of coniferous forest habitat with moderate to high road densities. A large percentage of the land in this DAU is under U.S. Forest Service (USFS) ownership. In general, the northern and western portions of the DAU provide good white-tailed deer habitat, while the heavily forested and higher elevation eastern portion supports whitetails at much lower densities. The southern and western portions of this DAU are of mixed ownership, having more open rangeland and private properties at lower elevations along the Salmon River and USFS-owned coniferous forest at higher elevations.

Based on harvest reports for the past 20 years, white-tailed deer populations in all Nez Perce–Clearwater Forest management units appear to be thriving (IDFG PR Reports 1993–2013).

Issues

Coniferous forest, primarily under USFS ownership, is the predominant habitat type for this DAU, especially in the eastern portion. Timber harvest, wildfires, and recent prescribed fires, conducted primarily to enhance elk habitat, help provide a mixture of successional stages that also benefit whitetails.

Noxious weeds, such as yellow star thistle and spotted knapweed, are out-competing native vegetation on lower elevation spring and winter ranges and threaten to displace deer from that habitat.

Construction of new home-sites has impacted white-tailed deer habitats and limited hunter access and, consequently, management options in areas adjacent to the Plan Area.

7.9.9.2 DAU 3, Northern Agriculture

DAU 3 is comprised of GMUs 5, 8, 8A, 10A, 11, 11A, and 13. Portions of all of the GMUs, except Unit 5, are on or adjacent to the Plan Area. Approximately 74% of DAU 3 consists of private property, nearly equally split between dryland agriculture and coniferous forest habitats. Hunter densities, success rates, and the opportunity to harvest a mature buck white-tailed deer are amongst the highest in the state.

Habitat in this DAU is nearly ideal for white-tailed deer, and populations are thriving. The mixture of agricultural crops and coniferous forest stands has resulted in a high-density white-tailed deer population.

Issues, Stressors, Concerns

The construction of new home-sites in some portions of DAU 3 has decreased available white-tailed deer winter ranges, limited hunter access, and restricted management options.

Depredation complaints involving white-tailed deer are common in this DAU. The large private property component of this DAU has led to a number of management challenges, including depredations on agricultural crops, achieving adequate antlerless harvest, and tensions between landowners and sportsmen over access/trespass issues. Maintaining hunting opportunities on adjacent Forest Service lands is important to managing white-tailed deer populations and depredation in areas where the Forest provides the only public access.

A large-scale epizootic hemorrhagic disease (EHD) outbreak started in the Kamiah area in late July 2003. Previously, EHD had been confirmed only once in the region, that being a small-scale outbreak in 2000 near Peck. The 2003 outbreak ended with a hard frost that interrupted the *Culicoides* spp. gnat life cycle in October. While centered on the Kamiah and Kooskia area, white-tailed deer deaths caused by EHD were observed in lower elevations along the Clearwater, South Fork Clearwater, and Salmon rivers. Although actual losses will never be known, localized losses probably ranged from 20–80% in some areas. It is likely that several thousand white-tailed deer died. No major outbreaks have been detected since 2003 and white-tailed deer populations rebounded quickly; the population of whitetails is currently thought to exceed 2003 numbers.

7.9.9.3 DAU 4, Backcountry

DAU 4 is comprised of GMUs 16A, 17, 19, and 20. Land ownership in this DAU is greater than 99% Forest Service. Habitat varies from mesic forest conditions in the Selway River drainage to dry, open pine/grassland habitat in the Salmon River drainage. Road densities are extremely low, with most roads acting as peripheral access to the Selway-Bitterroot, Gospel Hump, and Frank Church-River of No Return Wilderness areas. This low road density contributes to relatively low deer vulnerability in the area. Hunter densities are low in this DAU. Because of the low white-tailed deer density and low hunter participation, IDFG does not conduct population monitoring or modeling for this DAU.

Little quantifiable information exists on present or historic white-tailed deer populations in this DAU. We do know that Mule deer are more abundant than white-tailed deer. The rugged and remote nature of this area will continue to limit the impacts of humans on white-tailed deer and habitat.

White-tailed deer harvest has declined in this DAU; however, IDFG believes that harvest has declined because of reduced effort, not changes in population. Most of the deer harvest in these GMUs has historically been incidental to elk hunting, and elk hunter participation has declined substantially in these backcountry units.

Issues, Stressors, Concerns

Because DAU 4 is predominately designated wilderness, very little intentional habitat management occurs. Habitat trend is largely determined by wildfire occurrence and extent. Fires have been sporadic in recent years, affecting relatively small portions of occupied habitat. Perhaps the most significant recent habitat trend in portions of the DAU has been increasing infestations of noxious weeds, which can displace desired forage and reduce available white-tailed deer habitat.

7.10 Gray Wolf

For a comprehensive chronology of events related to wolf recovery, administrative roles and authority, conservation, and management in Idaho, see: *http://www.fishandgame.idaho.gov/cms/wildlife/wolves/timeline.cfm*.

7.10.1 *Importance in the Planning Area*

Wolves are one of the most important, and controversial, wildlife species in the Plan Area. As large predators, wolves can and do influence the size, composition, and behavior of large ungulates like elk, deer, and moose that are not only popular with hunters and economically important to the region and state, but are themselves manipulators of the environment.

Wolves are managed as a big game species in Idaho and are actively hunted and trapped in the Plan Area. Wolf harvest in Idaho Department of Fish and Game (IDFG) Elk City Game Management Units (GMUs) 14, 15, and 16 was among the highest in the state. Wolves harvested in Idaho County and Clearwater County—areas that mostly occupy Forest lands—had a market value of $3,710 and $1,575 in the 2011–2012 and 2012–2013 harvest seasons respectively.

Wolves are also important to wildlife advocates and wildlife watchers. Although many people participate in wildlife viewing—in 2006, 746,000 people watched wildlife in Idaho and spent $273 million while doing so (USFWS 2007*b*)—wolf viewing has yet to provide significant economic benefit in Idaho. Some Idaho outfitters have offered wolf viewing opportunities, but they indicate it was not a lucrative portion of their business. Although potential participation in wolf viewing is unknown, respondents to a random survey indicated that 42% of non-hunters would travel to see a wolf and 20% of non-hunters would pay an average of $123 to an outfitter to see a wolf (median = $100). In the same survey, 20% of hunters said they would travel to see a wolf, and on average would pay $115 to an outfitter to see one (median = $100). (Cite)

Wolves are a factor in declines of elk herds in some parts of the Planning Area, particularly in the Lolo and Selway Elk Management Zones. Declining elk numbers have resulted in economic loss to IDFG because of reductions in deer or elk tag sales in those Zones. Trends in elk populations may dictate reductions in elk hunting opportunity in those and other Zones in the near future, further reducing support for wildlife management in those areas. Also, according to outfitters, changes in elk behavior attributable to wolves have negatively impacted specific outfitter operations (G. Simonds, IOGA, personal communication, cited in WMP).

7.10.2 *Biology*

The understanding of the biology, impacts, and benefits of wolves has increased since their reintroduction into Idaho. The original recovery environmental impact statement (EIS) analyzed potential impacts and benefits of 100 wolves in Idaho, a biologically recovered population target that was reached in 1998. At the end of 2007, IDFG and the Nez Perce Tribe estimated more than 732 wolves in Idaho; this is more than 7 times the number analyzed for potential impacts and benefits in the EIS. The current wolf population is estimated to be approximately XX statewide; the population in the Plan Area is estimated to be XXX.

7.10.3 *Distribution, Reproduction, and Population Growth*

Wolves are widely distributed in Idaho from the Canadian border south to the Snake River plain. Most wolf pack territories in Idaho occur wholly or predominantly on U.S. Forest Service (USFS) or other public lands.

Of 83 packs documented in 2007, 59 produced litters (200 pups) and 43 qualified as breeding pairs. A breeding pair is defined as an adult male and an adult female wolf that have produced at least 2 pups that survived until December 31 of the year of their birth during the previous breeding season. Wolf pup counts were conservative estimates because not all pups in monitored packs were observed, and some documented packs were not visited. Documented litter size ranged from 1 to 8; average litter size, where counts were believed to be complete, was 4.1. Ten new breeding pairs were documented, and the reproductive status of 24 documented packs was either not verified or believed to be non-reproductive during 2007. The statewide wolf population increased 10% from the previous year’s estimate.

Movement of wolves and connectivity between states and provinces continues to be well documented. At least 15 documented packs use the border between Montana and Idaho and reside part-year in each state, and 2–3 other packs move among Wyoming, Yellowstone National Park, and Idaho.

Radio-collared wolves from the Boundary pack move freely among Canada, Idaho, and northwestern Montana. A Global Positioning System-collared wolf moved from just south of Banff National Park, Alberta to west of Dworshak Reservoir in the Clearwater region where it now appears to be a permanent resident. Wolves are very mobile and are now expanding their range outside of what has been considered optimal habitat. They are beginning to show up more regularly on private land with livestock grazing. Central Idaho wolf populations may be nearing saturated conditions. In this situation, territoriality and pack density limit room for additional breeding pairs so that population growth can only be accommodated through range expansion. Dispersers that survive eventually find a mate and become breeders.

7.10.4 *Mortality*

Of 77 documented wolf mortalities in 2007, 67 were caused by humans, 2 were attributed to natural causes, and 8 were due to unknown causes. Of 67 confirmed human-caused mortalities, 43 wolves were killed in response to livestock depredations, 9 were illegally taken, 8 were from other human causes, and 7 were legally taken (shot by landowner while harassing or attacking livestock). These figures underestimate true mortality because only a small proportion of wolves are radio-collared. Researchers lacked the means to estimate pup mortality prior to observations at dens or rendezvous sites. **(Note: mortality data will be udpdated.)**

Lethal removal by Wildlife Services to address livestock depredations has generally increased since reintroduction, from 1 in 1996 to a high of XX in 20XX. Under the Endangered Species Act, 10(j) rule (revised), livestock operators were given the option to kill wolves harassing livestock (previously, lethal removal was only allowed when wolves were observed actually attacking livestock). XX wolves have been killed under provisions of the revised 10(j) rule since 2005.

7.10.5 *Impacts on Big Game Populations*

Wolf impacts on wild ungulate populations are variable in space, time, and magnitude. In the Lolo Elk Zone, wolf predation impacts on elk have been documented over the last few years. Based on cause-specific mortality of radio-collared elk in the Lolo Zone, wolf predation on cow elk is a significant factor in that elk population's inability to stabilize or increase, particularly in GMU 12 (update with references from 2014 Predator Mgt Plan). Similarly, wolf predation may be causing reductions in harvestable surplus in other areas, even if elk populations are not declining.

Wolves are also likely impacting the behavior and habitat use of elk during hunting seasons, thus possibly reducing success rates for some hunters. Behavioral changes of elk, documented by researchers in the greater Yellowstone ecosystem, show elk spending more time in forested areas, on steeper slopes, and at higher elevations than before wolf reintroductions (Creel and Winnie 2005, Mao et al. 2005). IDFG will continue to closely monitor impacts of wolves on ungulates as this aspect of wolf recovery is very important to big game managers and hunters. Under the 2002 State Plan, IDFG has an obligation to ensure that wolves in increasing numbers do not adversely affect big game populations. Predation pressures on elk and deer are natural sources of mortality that are accounted for in natural systems and not problematic at some level. Predation has unknown benefits through selection processes as well as influence on populations that may be either beneficial or detrimental to the population, depending on time, location, environmental and habitat conditions, and point of view.

Wolves are effective predators and scavengers that feed primarily on large ungulates throughout their range (Murie 1944, Pimlott 1967, Mech 1970, Van Ballenberghe et al. 1975, Carbyn 1983, Ballard et al. 1987, Gasaway et al. 1992, Boyd et al. 1994). Ungulates comprise nearly all of the winter diet of most wolves. Of the ungulates killed during winter by wolves that have colonized northwestern Montana from the mid-1980s, 63% were deer (60% white-tailed deer and 3% mule deer), 30% were elk, and 7% were moose (Boyd et al. 1994, Kunkel et al. 1999). Wolves elected white-tailed deer wintering areas and selected deer over elk and moose (Kunkel et al. 1999). An established population of wolves in northwestern Montana and southeastern British Columbia was responsible for the annual mortality of 6% of female white-tailed deer and 3% of female elk (Kunkel 1997, Kunkel and Pletscher 1999).

In Yellowstone, elk made up 89% of the 449 kills made by wolves during winters 1995–1997 (Phillips and Smith 1997, Smith 1998). In 2000, 281 elk (87%), 10 bison (3%), 4 moose (1%), 5 deer (3%), 4 coyotes (1%), 1 wolf, and 17 unknowns (5%) were determined to be killed by wolves during the mid-winter observation period. Composition of elk kills was 34% calves, 34% cows, 19% bulls, and 13% unknown. Bison kills included 3 calves, 1 cow, 1 bull, and 4 adults of unknown sex. Remains of voles, ground squirrels, snowshoe hare, coyotes, bears, insects, and vegetation were also found in wolf scats (Smith 1998).

Prey selection and frequency of killing by wolves varies greatly depending on many factors including pack size; snow conditions; the diversity, density, and vulnerability of prey; and the degree of consumption of the carcasses (Kunkel 1997). Snow depth and wolf density best explained the annual variation in kill rate in northwestern Montana (Kunkel 1997). Based on studies with the most similar species and diversity of prey (Carbyn 1983, Keith 1983, Boyce 1990, Vales and Peek 1990, Mack and Singer 1992), wolves are projected to kill about 16.5 ungulates per wolf per year in Idaho, where they are expected to feed primarily on mule deer and elk (USFWS 1994).

During the first 3 years of an intensive predation study in Yellowstone, wolves killed at a rate equivalent to approximately 10.7 kills/wolf/year during early winter (Phillips and Smith 1997, Smith 1998). The rate increased to about 23.3 kills/wolf/year by late winter (Phillips and Smith 1997, Smith 1998). Elk made up 90% of the wolf kills examined. Wolves in Idaho are expected to be less reliant on elk and more reliant on mule deer and white-tailed deer compared to Yellowstone, where primary alternative prey options include bison and antelope (IDFG Wolf Management Plan, 2010). However, in the first year of a winter predation study near Salmon, Idaho, deer made up only 10% of the prey killed by the Moyer Basin and Jureano Mountain wolf packs during winter, which is significantly less than their proportion of abundance (Husseman and Power 1999, Husseman 2002). Wolves selected calf elk in excess of their proportion of abundance in the population (Husseman and Power 1999, Kuck and Rachael 1999, Carbyn (1987). Wolves selected older and younger deer and elk than did hunters in northwestern Montana (Kunkel et al. 1999). Vales and Peek (1995) examined several studies that reported the age structure of deer and elk killed by wolves compared to the estimated age structure of the deer and populations In several studies wolves were documented to take old deer in excess of their proportion of abundance in the population; and they tended to take elk calves in excess of their proportion of abundance in the population ; Kunkel et al. 1999). Fifty-eight percent of elk killed by wolves near Salmon, Idaho during winter 1999 were calves (Husseman and Power 1999); whereas, calves comprised approximately 17% of the elk population in the area at that time (Kuck and Rachael 1999).

Kill rates of wolves may vary widely by area and from year to year depending upon primary prey species, prey abundance, and weather conditions, among other factors. Most often the effects on prey populations that are attributable to wolf predation are unknown because of the lack of information on population dynamics of the prey populations and the rates of other mortality sources. However, Kunkel and Pletscher (1999) documented that predation by wolves and other predators (i.e., mountain lions, grizzly bears, black bears, coyotes, and humans) on ungulate species in northwestern Montana appeared to be mostly additive to the effect of other mortality factors, and that predation appeared to be the primary factor limiting the growth of deer and elk populations.

7.10.6 *Ecological Effects of Wolf Predation*

Evidence exists in Yellowstone National Park showing that the elk population and elk use of riparian willow (*Salix* spp.) habitat have declined since wolf recovery. Reduced elk use allowed recovery of some willow habitats, thereby producing a cascade effect benefiting a wide range of animal species (Ripple and Beschta 2004). Elk carcasses resulting from wolf predation are also being used by an entire suite of scavengers and other carnivores, potentially increasing fitness of species such as grizzly bears (*Ursus arctos*), red and grey foxes (*Vulpes vulpes* and *Urocyon cinereoargenteus*), common ravens (*Corvus corax*), and bald and golden eagles (*Haliaeetus leucocephalus* and *Aquila chrysaetos*) (Smith et al. 2003).

Predation studies have repeatedly shown that selection by wolves favors young, old, or physically impaired prey animals (Mech et al. 2001, Husseman 2002, Smith et al. 2003). Strong selection for disadvantaged prey may result in a mitigating effect on overall wolf impacts to prey populations due to the compensatory mortality component of wolf predation, or when wolves selectively prey on older, non-productive individuals that no longer contribute to population maintenance or growth.

7.10.7 *Idaho Department of Fish and Game Wolf Management Goals and Objectives*

IDFG currently oversees management of wolves in Idaho and coordinates among agencies to fulfill obligations under the revised 10(j) rule, Endangered Species Act, and 20XX State Plan.

The goal of the IDFG plan is to ensure that populations are maintained at 2005–2007 population levels (518–732 wolves) during the 5-year post-delisting period through adaptive management under the guidelines of the 2002 State Plan. Consistent with the delisting rule, the State goal is to ensure the long-term viability of the gray wolf population. In order to ensure that the population goal is achieved, the Department will maintain ≥15 breeding pairs (floor threshold). The Department will maintain balanced wolf and prey populations and ensure genetic transfer among states by maintaining connectivity and functional metapopulation processes. The Department will also manage wolves to minimize conflict with humans and domestic animals.

Secondarily, an important component the IDFG management approach is to maintain a harvest opportunity for wolves. Ideally, wolf population objectives should also reflect ability to monitor packs, breeding pairs, and total wolves, as well as harvest and monitoring objectives in neighboring states. Therefore, the long-term objective is to maintain viable wolf populations in the state, achieve short-term harvest goals to reduce conflicts, provide annual harvest opportunity, as well as to provide for non-consumptive benefits.

Based on stakeholder input, the most important objective within the management plan will be conflict resolution when wolf populations meet or exceed the population goal of the plan. Future population goals will reflect knowledge gained each year. However, the statewide population will be managed to range between the 2005 and 2007 levels and not be allowed to fall to a level where management of conflicts has to be restricted (<15 breeding pairs). The objectives addressed above fall within 11 broad objectives identified in IDFG’s strategic plan.

7.10.8 *Status and Trends*

The Idaho wolf population has continued to expand in size and distribution since initial reintroductions in 1995, reaching ESA recovery goals by the end of 2002. In the Clearwater region in 2014, there were XX wolves, XX packs, and XX groups, the great majority of which reside in the Plan Area.

Wolf monitoring and management activities have been reported by Wolf Management Zones (WMZs) since 2008. Three WMZs, each of which comprise several GMUs, are within the Planning Area. (An up-to-date analysis of wolf pop trends will be inserted here.)

7.10.9 *Issues and Concerns*

Wolf predation remains a major concern in the Lolo and Selway Units within the Plan Area and, to a lesser extent, other Units. IDFG will continue to manage for reduced numbers of wolves in those portions of the Plan Area where wolf predation on big game populations is a concern and to maintain current populations where appropriate.

Literature Cited

(Under Development)

Bleich, V. C., R. T. Bowyer, and J. D. Wehausen. 1997. Sexual segregation in mountain sheep: Resources or predation? Wildlife Monographs 134:50pp.

Cook, John G. 2002. In: North American Elk Ecology and Management. Toweill and Thomas, editors. Chapter 5: Nutrition and Food. Smithsonian Institution Press.

Council for Agricultural Science and Technology (CAST). 2008. Pasteurellosis transmission risks between domestic and wild sheep. CAST Commentary, QTA2008-1, Ames, Iowa, USA.

Idaho Department of Fish and Game (IDFG). 2010. Bighorn sheep management plan. Idaho Department of Fish and Game, Boise, USA.

Montana Department of Fish, Wildlife, and Parks (MDFWP). 2010. Montana Bighorn Sheep Conservation Strategy, Montana Department of Fish, Wildlife, and Parks, Helena, USA.

Phillips, Gregory E. and WA Alldredge. 2000. Reproductive success of elk following disturbance by humans during calving season. Journal Wildlife Management, Vol. 64, No. 2. Pages 521–530.

Sawyer, H., and F. Lindzey. 2002. A review of predation on bighorn sheep (Ovis canadensis). Wyoming Cooperative Fish and Wildlife Research Unit, Laramie, USA.

Schommer, T., and M. Woolever. 2008. A review of disease-related conflicts between domestic sheep and goats and bighorn sheep. U.S. Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-209, Fort Collins, Colorado, USA.

Western Association of Fish and Wildlife Agencies (WAFWA). 2007. Recommendations for domestic sheep and goat management in wild sheep habitat.